MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS INSTITUTION: UGC, GOVT. OF INDIA)
ELECTRONICS AND COMMUNICATION ENGINEERING

MASTER OF TECHNOLOGY
SYSTEMS & SIGNAL PROCESSING

COURSE COVERAGE SUMMARY AND QUESTION BANK

Academic Year
(2016 - 2017)
<table>
<thead>
<tr>
<th>S.No</th>
<th>Semester</th>
<th>Subject</th>
<th>Content</th>
<th>Page No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Course Structure</td>
<td>Syllabus</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>SEM-I</td>
<td>Transform Techniques</td>
<td>Syllabus</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Course Coverage Summary</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Previous Question Papers</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Multimedia Processing</td>
<td>Syllabus</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Course Coverage Summary</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Previous Question Papers</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Embedded System Design</td>
<td>Syllabus</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Course Coverage Summary</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Previous Question Papers</td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Biomedical Signal Processing</td>
<td>Syllabus</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Course Coverage Summary</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Previous Question Papers</td>
<td>29</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Advanced Data Communications</td>
<td>Syllabus</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Course Coverage Summary</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Previous Question Papers</td>
<td>38</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Advanced Operating Systems</td>
<td>Syllabus</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Course Coverage Summary</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Previous Question Papers</td>
<td>48</td>
</tr>
<tr>
<td>8</td>
<td>SEM-II</td>
<td>Adhoc –Wireless Networks</td>
<td>Syllabus</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Course Coverage Summary</td>
<td>51</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Coding Theory &amp; Techniques</td>
<td>Previous Question Papers</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Syllabus</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Course Coverage Summary</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Previous Question Papers</td>
<td>62</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Multirate Signal Processing</td>
<td>Syllabus</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Course Coverage Summary</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Previous Question Papers</td>
<td>73</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>Embedded RTOS</td>
<td>Syllabus</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Course Coverage Summary</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Question bank</td>
<td>77</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>Mobile Computing Technologies</td>
<td>Syllabus</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Course Coverage Summary</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Previous Question Papers</td>
<td>85</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>Advanced Networks Programming</td>
<td>Syllabus</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Course Coverage Summary</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Previous Question Papers</td>
<td>92</td>
</tr>
</tbody>
</table>
## COURSE STRUCTURE

### I Year I Semester

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>SUBJECT CODE</th>
<th>SUBJECT</th>
<th>L</th>
<th>T/P/D</th>
<th>C</th>
<th>MAX MARKS</th>
<th>INT</th>
<th>EXT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R15D9301</td>
<td>Transform Techniques</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>R15D9302</td>
<td>Multimedia Processing</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>R15D9303</td>
<td>Embedded System Design</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>R15D9304</td>
<td>Elective 1</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R15D9305</td>
<td>1. Biomedical Signal Processing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R15D9306</td>
<td>2. Radar Signal Processing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R15D9306</td>
<td>3. VLSI Signal Processing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>R15D9307</td>
<td>Elective 2</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R15D9308</td>
<td>1. Advanced Data Communications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R15D9309</td>
<td>2. Detection and Estimation Theory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R15D9309</td>
<td>3. Digital System Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>R15D3601</td>
<td>Open Elective 1</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R15D3602</td>
<td>1. Advanced Operating Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R15D3603</td>
<td>2. Advanced Computer Architecture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R15D3603</td>
<td>3. Voice over Internet Protocol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>R15D9381</td>
<td>Advanced Signal Processing Lab1</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>25</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>R15D9382</td>
<td>Technical Seminar</td>
<td>-</td>
<td>2</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td>24</td>
<td>3</td>
<td>22</td>
<td>225</td>
<td>525</td>
<td></td>
</tr>
</tbody>
</table>
### I Year II Semester

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>SUBJECT CODE</th>
<th>SUBJECT</th>
<th>L</th>
<th>T/P/D</th>
<th>C</th>
<th>MAX MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>INT</td>
</tr>
<tr>
<td>1</td>
<td>R15D9310</td>
<td>Adhoc –Wireless Networks</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>25 75</td>
</tr>
<tr>
<td>2</td>
<td>R15D9311</td>
<td>Coding Theory &amp; Techniques</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>25 75</td>
</tr>
<tr>
<td>3</td>
<td>R15D9312</td>
<td>Multirate Signal Processing</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>25 75</td>
</tr>
<tr>
<td>4</td>
<td>R15D9313</td>
<td>Elective 3</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>25 75</td>
</tr>
<tr>
<td></td>
<td>R15D9314</td>
<td>1. Hardware-Software Co-Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R15D9315</td>
<td>2. Embedded RTOS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Wireless Channel Coding</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>R15D9316</td>
<td>Elective 2</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>25 75</td>
</tr>
<tr>
<td></td>
<td>R15D9317</td>
<td>1.Mobile Computing Technologies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R15D9318</td>
<td>2. SoC Architectures</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Array Signal Processing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>R15D3604</td>
<td>Open Elective 2</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>25 75</td>
</tr>
<tr>
<td></td>
<td>R15D3605</td>
<td>1. Advanced Computer Networks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>R15D3606</td>
<td>2. Multimedia Signal Coding</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Cloud Computing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>R15D9383</td>
<td>Advanced Signal Processing Lab 2</td>
<td></td>
<td>3</td>
<td>2</td>
<td>25 75</td>
</tr>
<tr>
<td>8</td>
<td>R15D9384</td>
<td>Technical Seminar</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>24</td>
<td>3</td>
<td>22</td>
<td>225 525</td>
</tr>
</tbody>
</table>

### II Year I Semester

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>SUBJECT CODE</th>
<th>SUBJECT</th>
<th>L</th>
<th>T/P/D</th>
<th>C</th>
<th>MAX MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>INT</td>
</tr>
<tr>
<td>1</td>
<td>-</td>
<td>Project Review Seminars</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>Project Work</td>
<td>-</td>
<td>-</td>
<td>18</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>-</td>
<td>-</td>
<td>22</td>
<td>-</td>
</tr>
</tbody>
</table>

### II Year II Semester

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>SUBJECT CODE</th>
<th>SUBJECT</th>
<th>L</th>
<th>T/P/D</th>
<th>C</th>
<th>MAX MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>INT</td>
</tr>
<tr>
<td>1</td>
<td>-</td>
<td>Project Work</td>
<td>-</td>
<td>-</td>
<td>22</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>Project Viva-voce</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>-</td>
<td>-</td>
<td>22</td>
<td>-</td>
</tr>
</tbody>
</table>
I-SEMESTER
TRANSFORM TECHNIQUES

UNIT -I:
Fourier Analysis: Vector space, Hilbert spaces, Fourier basis, FT- Limitations of Fourier Analysis, Need for time-frequency analysis, DFT, 2D-DFT: Definition, Properties and Applications, IDFT, Hilbert Transform, STFT.

UNIT -II:
Transforms: Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT, – definition, properties and applications

UNIT -III:

UNIT -IV:
Multi Rate Analysis and DWT: Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -V:
Special Topics: Wavelet Packet Transform, Multidimensional Wavelets, Bi-orthogonal basis-BSplines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS:

REFERENCE BOOKS:
<table>
<thead>
<tr>
<th>S.No</th>
<th>Subject</th>
<th>Text Book Title</th>
<th>Chapters In Text Book</th>
<th>Units / Topics Covered</th>
<th>Author</th>
<th>Publishers &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Transform Techniques</td>
<td>Wavelet Transforms Introduction theory and applications</td>
<td>1,2,3,4,5</td>
<td>I, III, IV, V</td>
<td>Raghuveer M.Rao</td>
<td>Pearson Edu, 2003 Asia, New Delhi</td>
</tr>
</tbody>
</table>
M.Tech. I Year - I Semester supplementary Examinations, Aug 2016
Transform Techniques

SECTION - I

1. (a) Determine the Fourier series of the following function.

(b) State and prove the properties of circular convolution of DFT and 2-D DFT.

(OR)

2. (a) Write the expression for Vector, Vector Spaces and Hilbert spaces.
(b) Write the expression for Local Basis and Riesz basis and its uses.

SECTION - II

3. (a) Define walsh and hadamard function and find 8x8 hadamard matrix.
(b) Find DCT of the following matrix.

\[
\begin{bmatrix}
2 & 2 & 3 \\
2 & 4 & 3 \\
3 & 2 & 1 \\
\end{bmatrix}
\]

(OR)

4. (a) Define Haar function and write 4 x 4 Haar matrix.
(b) What is the comparison of DCT, DST, KLT.

SECTION - III

5. (a) Write about some example of CWT and is applications.
   (b) Write the expression for Wavelet function, Scaling function, and Heisenberg boxes of wavelet atoms.

(OR)

6. (a) What is Daubechis?. Comparison between Fourier transforms Windowed Fourier transform and Wavelet Transform
   (b) Write about the Tilling of time scale plane for CWT. What is STFT? How it related to CWT?
SECTION – IV

7. (a). What is MRA? How a function can be estimated band on MRA?
(b) Write the structure of DWT Filter Banks and its Applications.

(OR)

8. (a) What is Discrete Wavelet Transform and Fast Wavelet Transform.
(b) Write about DWT and FWT in two dimensions.

SECTION – V

9. (a) How the Bi-orthogonal pair of filters used for a function reconstruction?
(b) How multi-wavelets are used to estimate a function?

(OR)

10. (a) Which transform is used for sub-band coding of speech? How?
(b) Write short note on Multidimensional Wavelets and its applications.

************
SECTION – I

1. (a) Determine the inverse Z-Transform of the following function.
   i) \( H(Z) = \frac{1+Z^{-1}}{(1+3Z^{-1}+2Z^{-2})} \) for \( Z > 2 \)
   ii) \( H(Z) = \frac{Z(Z^2-4Z+5)}{(Z-1)(Z-2)(Z-3)} \) FOR ROC i. \( 2 < Z < 3 \) (ii) \( Z > 3 \) (iii) \( Z < 1 \).
   (b) State and prove any two properties of STFT and 2-D DFT.
   (OR)

2. (a) Write the limitations of Fourier analysis.
   (b) Write the expression for IDFT and 2D IDFT and give one example.

SECTION – II

3. (a) Define Hoar function and write 8 x 8 Hoar matrix.
   (b) Find DCT of the following matrix.
   \[
   \begin{bmatrix}
   x & 3 & 4 \\
   5 & 3 & 6 \\
   2 & 4 & 1
   \end{bmatrix}
   \]
   (OR)

4. (a) Define Hadamard function and write Hadamard 8 x 8 H matrix.
   (b) State and prove any two properties of DST and KST

SECTION – III

5. (a) Why wavelets are needed?. What are the required conditions for a functional to be act as a wavelet?
   (b) Write the expression for Hat function, Meyer function of wavelet atoms.
   (OR)

6. (a) What is STFT?. How it related to Continuous time Wavelet Transform?
   (b) Write about the Concept of Scale and its relation with frequency.
SECTION – IV

7. (a) What is the need for scaling function and the Multi Resolution Analysis? (b) What is the condition for perfect reconstruction of wavelets? its Applications.

(OR)

8. (a) What is the Relationship between Filter Banks and Wavelet Basis? (b) Write about DWT and FWT in two dimensions.

SECTION – V

9. (a) Write about the Wavelet Packet Transform and its advantages? (b) How multi-wavelets are used to estimate a function?

(OR)

10. (a) Write a short note on sub-band coding. (b) Write short note Bi-orthogonal basis.

* * * * * * * * * *
Code No: 5193D
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech I Semester Examinations, February - 2014
TRANSFORM TECHNIQUES
(Systems and Signal Processing)

Time: 3 Hours
Max. Marks: 60

Instructions:

i) Part A is compulsory Question for 20 marks.
ii) Part B consists of five questions with “either” “or” pattern. The student has to answer any one. However students have to answer five questions from Part B (numbered from 2 to 6)

PART - A
(Answer all sub questions)

1.a) Define DFT and 2D DFT of a signal.
b) Explain properties of K-L Transform.
c) Explain Meyer wavelet transform.
d) Define Daubechies wavelet function.
e) Explain Bi-orthogonal basis.

5 × 4 marks = 20

PART - B

5 × 8 marks = 40

Answer either “a” or “b” from each question, but not both

2.a) A Hilbert transform is a filter with frequency Response H_0(\omega) = -jsgn(\omega), then plot the magnitude and phase response. Also find its impulse response.

OR

b) Let a and b be the two integers with many digits. Relate the product ab to a convolution. Explain how to use the FFT to complete this product.

3.a) The sampled voltages obtained by scanning the intensity distribution of photographic image are {3.2, 3.6, 3.3, 2.9, 1.7, 1.6, 1.8, 1.5}. Discuss the relative merits of transforming these data by DWT.

OR

b) Draw up a table to show the advantages, disadvantages and applications of DCT, Haar and Hadamard transforms.

4.a) Explain Tiling of time scale plane for CWT.

OR

b) Explain the need for wavelets and necessity of wavelet basis.

5.a) Explain the need for scaling function in Multi Resolution Analysis.

OR

b) Explain an Alias free QMF filter Bank.

6.a) Design a signal that is well approximated in best local cosine basis but requires many more vectors to approximate it efficient in a best wavelet a packet basis.

OR

b) Describe a fast algorithm to complete the Meyer orthogonal wavelet transform with a lapped transform applied in Fourier domain.
1.a) Find the inverse-Z transform of the following function:
\[ H(z) = \frac{z(z+1)}{(z^2 + 2z + 1)(z-1)} \]

b) Write the equation of the inverse 2-D DFT and prove that the 2-D DFT can be constructed from 1-D DFT.

2.a) Define Haar function and find 8x8 Haar matrix.

b) Find the Hadamard transform of the following matrix
\[
\begin{bmatrix}
1 & 2 & 2 & 3 \\
2 & 4 & 3 & 1 \\
3 & 2 & 3 & 1 \\
3 & 4 & 2 & 3
\end{bmatrix}
\]

3.a) Define STFT and explain its properties along with its applications.

b) What is MRA? What are conditions required a function to be a scaling function?

4.a) Prove the inverse CWT exists and also write the required conditions.

b) Write about Haar, Mexican Hat wavelets.

5.a) Design an integrator with an integration factor of 2 and give its applications.

b) Draw a DWT filter bank for 2 level and explain the function of each block.

6.a) How lifting scheme is used to generate a Wavelets?

b) What is wavelet packet? How it differ from general wavelets?

7.a) Draw the block diagram of subband coding used for speech processing and explain the function of each block along with the principle of operation.

b) Explain how KL Transform is used for signal compression?

8. Write short notes on the following
   a) DCT
   b) Multi Wavelets.

******
1. (a) Find the inverse-Z transform of the following function:

\[ H(z) = \frac{2}{(z^2 + z + 1)(z + 1)} \]

(b) Define 2-D DFT and prove its convolution property. [12]

2. (a) Find 8×8 Slant matrix.

(b) How KL Transform different from other transforms? Give its applications. [12]

3. (a) Define inverse STFT and explain significance of each term and write applications of STFT.

(b) What is Scale function? How it relates to a wavelet function? [12]

4. (a) What is CWT? Write its properties.

(b) Write about shannon, Daubechies wavelets. [12]

5. (a) Why multi rate systems are needed? Design a decimator of a decimation factor 4.

(b) Draw two channel analysis and synthesis filter bank for DWT and explain function of each block. [12]

6. (a) What is meant by Bi-orthogonality? How is it used in Wavelets?

(b) Write a lifting scheme algorithm for wavelet generation. [12]

7. (a) What are the multi wavelets? Compare it with ordinary wavelets.

(b) What is wavelet tree? What are the applications of it? [12]

8. (a) How DCT is used for image processing?

(b) Explain how a DWT is used for signal compression. [12]

*****
Code No: 5193D

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech I Semester Examinations, April - 2015
TRANSFORM TECHNIQUES
(Systems and Signal Processing)

Time: 3hrs
Max. Marks: 60

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 8 marks and may have a, b, c as sub questions.

PART - A

1. a) What is Hilbert Transform?
   b) What is KL transform?
   c) What is Meyer wavelet?
   d) What is Scaling function?
   e) What are wavelet packets?

   $5 \times 4 \text{ Marks} = 20$

PART - B

2. Find the Fourier series representation for the following waveform and explain the limitations of Fourier analysis.

   $[8]$

3. State the properties and mention the applications of 2D-DFT.

   $[8]$


   $[8]$

5. Explain the properties and applications of DCT and DST.

   $[8]$

6. Compare STFT and wavelet transform in detail and explain the need for wavelets.

   $[8]$

7. Briefly discuss tiling of time scale plane for Continuous wavelet transform.

   $[8]$

8. Illustrate the multi resolution signal analysis by the wavelet transform.

   $[8]$


   $[8]$

10. Explain the concept of multiwavelets.

    $[8]$

11. Derive the expression for basis functions at level two, of wavelet packet decomposition.

    $[8]$

---0000---
UNIT I - Audio Processing Systems

UNIT II – Equalizers

UNIT III - Audio Coding
Audio Coding: Lossless Audio Coding, Lossy Audio Coding, Psycho acoustics, Advanced Audio Coding (MPEG Coding Standards), Spectral Band Replication, Java Applet- Psycho acoustics.

UNIT -IV:

UNIT –V:
Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation Block-Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

REFERENCE BOOKS:
## COURSE COVERAGE SUMMARY

<table>
<thead>
<tr>
<th>S.No</th>
<th>Subject</th>
<th>Text Book Title</th>
<th>Chapters In Text Book</th>
<th>Units / Topics Covered</th>
<th>Author</th>
<th>Publishers &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Digital Video Processing</td>
<td>1, 2, 3</td>
<td>IV</td>
<td>M. Tekalp</td>
<td>Prentice Hall International</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Video Processing and Communication</td>
<td>6</td>
<td>V</td>
<td>Yao Wang, Joem Osterman and Ya-quin Zhang</td>
<td>PH Int 1st Ed</td>
</tr>
</tbody>
</table>
MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
M.Tech. I Year - I Semester, February 2016
Sub: MULTIMEDIA PROCESSING
(Systems & Signal Processing)

Time: 3 hours
Max. Marks: 75

Note: Question paper Consists of 5 SECTIONS (One SECTION for each UNIT) and answer FIVE Questions, Choosing ONE Question from each SECTION. Each Question carries 15 marks.

* * * * * *

SECTION – I

1. (a) Explain the features of floating point interfaces.
   (b) Explain about MADI Interface. (8+7)
   (Or)

2. (a) Write short notes on standard bus Systems.
   (b) Explain connection via Serial Links and Connection via Parallel Links. (7+8)

SECTION – II

3. (a) Explain about the Fast Convolution of Long Sequences
    (b) Explain Multi-Complementary Filter Bank. (8+7)
    (Or)

4. (a) Explain about quantization effects in audio filters.
    (b) Explain Recursive Audio Filters Design. (7+8)

SECTION – III

5. Write Short notes on
   (a) Lossless audio Coding
   (b) Lossy audio Coding. (8+7)
   (Or)

6. (a) Explain MPEG-4 Audio Coding with neat Block Diagram.
    (b) With neat Block Diagram explain Spectral Band Replication (SBR) Decoder. (8+7)

SECTION – IV

7. (a) Explain Two-Dimensional Motion Models.
    (b) What is Geometric Image Formation model explain. (8+7)
    (Or)

8. (a) Explain characteristic features of Video signals.
    (b) Write and explain the Analog Video processing and extraction (8+7)
SECTION – V

9. (a) Explain mesh-based Motion Estimation.
   (b) Explain block matching Algorithm. (8+7)

(Or)

10. (a) Explain Region-Based Motion Estimation.
     (b) Write short notes on Application of motion estimation in video chatting (8+7)
SECTION – I
1. (a) Explain the features of fixed point interfaces.  
   (b) Explain about Two-Channel AES/EBU Interface. (8+7)  
(Or)
2. (a) Write short notes on multi processor Systems.  
   (b) Explain different peripherals used in multiprocessor systems. (7+8)

SECTION – II
3. (a) Explain about the Parametric Filter structures 
   (b) Explain fast convolution of audio filters design  
   (Or)
4. (a) Explain about 8-band Multi Complementary Filter Bank. 
   (b) Explain Filters Design by filter sampling (8+7)

SECTION – III
5. Write Short notes on 
   (a) Lossless Audio Coding 
   (b) Lossy Audio Coding. (8+7)  
(Or)
6. (a) Explain advanced Audio Coding with neat Block Diagram. 
   (b) Explain the structure of Java Applet of Psycho acoustics (8+7)

SECTION – IV
7. (a) Explain Three-Dimensional Motion Models. 
   (b) What is photometric Image Formation model explains. (8+7)  
(Or)
8. (a) Explain characteristic features of video signal 
   (b) Write and explain the analog video processing and extraction (8+7)

SECTION – V
9. (a) Explain pixel-based Motion Estimation. 
   (b) Explain Global Motion Estimation Algorithm. (8+7)  
(Or)
10. (a) Explain Waveform based coding.  
    (b) Explain Block based transform coding (8+7)

* * * * * * * * *
EMBEDDED SYSTEM DESIGN

UNIT –I:
ARM Architecture:
ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families.

UNIT –II:
ARM Programming Model – I:
Instruction Set: Data Processing Instructions, Addressing Modes, Branch, Load, Store Instructions,
PSR Instructions, Conditional Instructions.

UNIT –III:
ARM Programming Model – II:
Thumb Instruction Set: Register Usage, Other Branch Instructions, Data Processing Instructions,
Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions

UNIT –IV:
ARM Programming:
Simple C Programs using Function Calls, Pointers, Structures, Integer and Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, Conditional Execution and Loops.

UNIT –V:
Memory Management:

TEXT BOOKS:
2. Professional Embedded ARM development-James A Langbridge, Wiley/Wrox

REFERENCE BOOKS:
## COURSE COVERAGE SUMMARY

<table>
<thead>
<tr>
<th>S.No</th>
<th>Subject</th>
<th>Text Book Title</th>
<th>Chapters In Text Book</th>
<th>Units / Topics Covered</th>
<th>Author</th>
<th>Publishers &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Embedded System Design</td>
<td>ARM Systems Developers GuidesDesign &amp; Optimizing System Software</td>
<td>1,2</td>
<td>I-ARM Architecture</td>
<td>Andrew N. Sloss, Dominic Symes, Chris Wright,</td>
<td>Elsevier 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>Unit II-ARM Programming Model-I</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>Unit III-ARM Programming Model-II</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5,6</td>
<td>Unit IV-ARM Programming</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td>Unit-V Memory Management</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Note: Question paper Consists of 5 SECTIONS (One SECTION for each UNIT) and answer FIVE Questions, Choosing ONE Question from each SECTION. Each Question carries 15 marks.

SECTION - I

1. a) Explain the complete register organization of ARM processor
b) Explain the conditional flags of ARM Processor

(Or)

2. a) Explain the 5-stage pipelining process of ARM Processor
b) Explain the nomenclature and architecture evolution of ARM Processor

SECTION – II

3. a) Explain about the barrel shifter operation with a neat diagram
b) Explain the single register load store addressing modes of ARM Processor

(Or)

4. a) Explain the ARMv5E extensions with examples
b) Explain about the program status register instructions of ARM processor?

SECTION – III

5. a) Explain how do we interwork with ARM & thumb code?
b) Explain the stack instructions in brief with a sample code

(Or)

6. a) Explain all the data processing instructions of ARM processor with examples
b) Explain the thumb software interrupt instructions with sample code

SECTION – IV

7. a) Explain about the local variable types & function argument types
b) Write a c-code for the loops using a variable number of iterations

(Or)

8. a) Explain the concept of pointers aliasing with a sample c-code
b) Explain the structure arrangement in ARM processor with a sample c-code

SECTION – V

9. a) Explain the architecture of cache memory with a neat block diagram
b) Explain how the main memory maps to a direct mapped cache

(Or)

10. a) Explain the concept of flushing ARM cached cores with simple example
b) Explain the fast concept switch extension present in memory management unit of ARM processor

* * * * * * * * * *
1. (a) Explain the layout of a generic program status register of ARM processor in detail.
   (b) Explain the Interrupts and Interrupt vector table of ARM processor.
   (Or)

2. Explain the following hardware extensions of ARM wraps around the core:
   (a) Cache and Tightly coupled memory.
   (b) Memory management.

3. (a) Explain briefly about the branching instructions of ARM processor.
   (b) Explain about multiple register transfer instructions with examples
   (Or)

4. (a) Explain how do you differentiate ARM code with Thumb code with a simple program.
   (b) Explain the usage of registers in Thumb mode & Thumb instruction decoding.

5. (a) Explain the single register load store instructions in thumb mode with simple examples.
   (b) Explain how the compiler allocates the processor register to the local variables in a c- function.
   (Or)

6. (a) Explain how the compiler allocates bits within the bit field container.
   (b) Explain how the Endianess is configured in the ARM core.

7. (a) Explain the optimizing process for an assembly code in ARM core.
   (b) Explain how the ARM core can conditionally execute ARM instructions with simple program.
   (Or)

8. (a) Explain the four way set associative cache memory with a neat diagram.
   (b) Explain ARM core cache line replacement policies.

9. (a) Explain the level-1 page table entries and base address in memory management unit.
   (b) Explain the two levels virtual to physical address translation using coarse page tables.
   (Or)

10. (a) Explain the structure arrangement in ARM programming with a sample c-code.
    (b) Explain the stack instructions with examples in Thumb mode

******************
1. a) Explain the hardware units and devices in an Embedded system.
   b) Give the classification of embedded systems.

2. a) Discuss in detail the architecture of 8051 microcontroller.
   b) Explain the need for counters.

3. Discuss in detail memory and I/O devices interfacing to the microcontroller.

4. a) Compare Continuous timer blocks and Switched capacitor blocks.
   b) Draw the architecture of Programmable system-on-chip.

5. a) Explain in detail the architecture of Embedded RISC processor.
   b) Explain the modes of operation of ARM processor.

6. a) Explain the following terms:
    i) Context switch
    ii) Interrupt latency
   b) Explain the device drivers for internal programmable timing devices.

7. Describe the following:
   a) Serial communication protocols
   b) SDMA

8. Write notes on the following:
   a) Embedded software
   b) I/O ports
   c) Digital blocks.

* * * * *
M.Tech I - Semester Examinations, October/November-2011
MICROCONTROLLERS FOR EMBEDDED SYSTEM DESIGN
(COMMON TO DIGITAL ELECTRONICS & COMMUNICATION SYSTEMS, DIGITAL SYSTEMS & COMPUTER ELECTRONICS, ELECTRONICS & COMMUNICATION ENGINEERING, EMBEDDED SYSTEMS, EMBEDDED SYSTEMS & VLSI DESIGN, VLSI SYSTEM DESIGN)

Time: 3hours      Max. Marks: 60
Answer any five questions
All questions carry equal marks

1. a. What is an Embedded system? How is it different from a personal computer? 4M
   b. Explain the steps involved in the design process of an embedded system. 8M

2. a. Explain how External memory is interfaced to 8051. 8M
   b. Discuss the need for Timers. 4M

3. a. Write notes on the various Memory arbitration schemes. 6M
   b. Explain about PIC controllers. 6M

4. a. Discuss in detail PSOC architectures. 8M
   b. Explain about Digital blocks. 4M

5. Explain the Register set and instructions of ARM processor. 12M

6. a. What is context switch? When does it take place? 4M
   b. Explain in detail serial port device driver. 8M

7. a. Explain in detail the Ethernet protocol. 6M
   b. Discuss about the External bus interface. 6M

8. Write short notes on the following:
   i. Formalization of system design 4M
   ii. PIC Controllers 4M
   iii. Interrupt latency. 4M

* * * * *
1. a) What are the issues in designing embedded system?
b) Why does a processor system always need an interrupt handle? [6+6]

2. a) Explain the need of a watchdog timer and reset after the watched time.
b) What are the advantages of an ASIP for design of an embedded system? [6+6]

3. Explain the serial communications control operation in 8051 in different modes of operation. [12]

4. a) Draw a neat program model of ARM and explain its different modes of usage.
b) Explain the multiple register transfer instruction set of ARM processor. [6+6]

5. a) Explain events management? How are inter-task communication objects used for communication and synchronization?
b) How do we choose scheduling strategy for the periodic, aperiodic and sporadic tasks? [6+6]

6. a) How do you create a counseling semaphore?
b) How do we initiate round robin time series scheduling?
c) How do you let a lower priority task executes in a preemptive scheduler? [6+6]

7. a) Discuss about I2C bus communication with its devices.
b) How does CAN differ from I2C? [6+6]

8. Write brief note on:
a) SDMA
b) Continuous timer blocks in PSOC. [12]
1. a) Explain different Hardware units in Embedded systems.
   b) Explain the design process for an embedded application.
   c) Explain how embedded systems are classified.

2. a) Explain the memory mapped I/O and I/O mapped I/O.
   b) Explain how 8051 is interfaced to external memory.
   c) What are the different timers in 8051 and its modes?

3. a) Explain the ARM processor architecture.
   b) Give overview of programmable system on chip (PSOC).

4. a) Explain context switching with an example. What is Pre-emptive scheduling?
   b) Explain the procedure to write a device driver using interrupt service routine.

5. Explain serial communication protocols with an example.

6. a) What is the difference between CISC and RISC architectures?
    b) Explain continuous timer blocks and switched capacitor blocks.

7. Explain PIC controllers.

8. Write short notes on the following:
   a) Ethernet protocol.
   b) ARM6TDMI based embedded system.
BIOMEDICAL SIGNAL PROCESSING
(EFFECTIVE – I)

UNIT -I:

UNIT -II:
Data Compression Techniques: Lossy and Lossless data reduction Algorithms, ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantisation, DICOM Standards

UNIT -III:

UNIT -IV:

UNIT -V:
Neurological Signal Processing: Modelling of EEG Signals, Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves, Auto Regressive (A.R.) modelling of seizure EEG, Sleep Stage analysis, Inverse Filtering, Least squares and polynomial modelling.

TEXT BOOKS:

REFERENCE BOOKS:
## COURSE COVERAGE SUMMARY

<table>
<thead>
<tr>
<th>S.No</th>
<th>Subject</th>
<th>Text Book Title</th>
<th>Chapters In Text Book</th>
<th>Units / Topics Covered</th>
<th>Author</th>
<th>Publishers &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Biomedical Signal Processing- Principles and Techniques</td>
<td>Chapters 8, 7, 6, 9, 4, 5.</td>
<td>Units II, III, IV, V.</td>
<td>D.C.Reddy</td>
<td>2005, TMH.</td>
</tr>
</tbody>
</table>
SECTION – I
1. (a) Distinguish between time averages and ensemble averages of a random process.
   (b) If X(t) is a stationary process having mean value E[X(t)]=3 and auto correlation
   function \( R_{XX}(\tau) = 9 + 2e^{-|\tau|} \), find:
   a) The mean value and
   b) The variance of the random variable
   \[ Y = \int_{0}^{2} x(t) dt \]
   (or)

2. (a) Derive the expression for noise figure of N stage cascaded system.
   (b) An amplifier has three stages for which \( T_{e1} = 200K \) (first stage), \( T_{e2} = 450K \) and \( T_{e3} = 1000K \) (last stage). If the available power gain of the second stage is 5, what gain must
   the first stage have to guarantee an effective input noise temperature of 250K?

SECTION – II
3. Explain direct ECG data compression techniques.
   (or)
4. Explain data compression using KL transform.

SECTION – III
5. Explain various QRS detection techniques in ECG.
   (or)
6. Explain the adaptive noise cancellation with LMS adaptive algorithm.

SECTION – IV
7. Explain the signal averaging using mean and trend removal.
   (or)
8. Derive the Yule walker equations for estimation of LP coefficients using auto correlation
   method.

SECTION – V
9. Write short notes on
   a. Modeling of EEG signals.
   b. Detection of spikes and spindles.
   (or)
10. Write short notes on
    a. Sleep stage analysis.
    b. Inverse filtering.
1. (a) Show that time averaged auto correlation function and power spectral density form a Fourier transform pair.
(b) The auto correlation function of a random process $X(t)$ is
$$R_{XX}(\tau) = 3 + 2\exp(-4\tau^2)$$
(i) Find the power spectrum of $X(t)$.
(ii) What is the average power in $X(t)$?

(or)

2. (a) Derive the relation between effective noise temperature and noise figure of a system.
(b) We are given the random process
$$X(t) = A_0 \cos(\omega_0 t + \Theta)$$
Where $A_0$ and $\omega_0$ are constants and $\Theta$ is a random variable uniformly distributed on the interval $(0, \pi)$.
   a) Is $X(t)$ wide-sense stationary.
   b) Find the power spectrum of $X(t)$ and power.

SECTION – II

3. Explain any two transformation compression techniques.
   (or)

4. Explain the Huffman coding for data compression with an example.

SECTION – III

5. Explain various Arrhythmia detection algorithms.
   (or)

6. Explain fetal ECG monitoring.

SECTION – IV

7. Explain the analysis of evoked potentials.
   (or)

8. Explain prony’s method using Least Square estimation.

SECTION – V

9. Write short notes on
   a. Detection of alpha, beta and gamma waves.
   b. Polynomial modeling.
   (or)

10. Write short notes on
   a. Auto Regressive modeling of Seizure EEG.
   b. Detection of spikes and spindles

****
Code No: 5193F

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech I Semester Examinations, February - 2014
BIOMEDICAL SIGNAL PROCESSING
(Systems and Signal Processing)

Time: 3 Hours
Max. Marks: 60

Instructions:
i) Part A is compulsory Question for 20 marks.

ii) Part B consists of five questions with “either” “or” pattern. The student has to answer any

one. However students have to answer five questions from Part B (numbered from 2 to 6)

PART - A
(Answer all sub questions) 5 × 4 marks = 20

Explain stationary random processes with suitable example.
Classify data compression techniques and list the features of each technique.
How do you identify ST segment and how is it analyzed?
Write short notes on evoked potentials.
Explain the EEG rhythms and transients with waveforms.

PART - B
5 × 8 marks = 40

Answer either “a” or “b” from each question, but not both

a) Define and derive the power spectral density calculation of a random process.

b) Write the Properties of auto correlation with relevant expressions.

3.a) Expand CORTES and explain the process of data compression using CORTES.

b) Explain the principle of operation of the turning point algorithm.

4.a) How does adaptive filter adjust the parameters to the available input samples?

Explain with one example.

b) Explain with neat block diagram and necessary waveforms the multiple reference

noise canceller used in fetal ECG enhancement.

5.a) Explain the 5th order Y-W equations.

b) Discuss the Least squares technique in signal modeling.

6.a) Describe how the EEG signals are generated. Give a model of EEG signal.

b) Describe the characteristics of different stages of sleep in terms of frequency and

voltage levels.
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech I SEMESTER EXAMINATIONS, APRIL/MAY-2013
BIOMEDICAL SIGNAL PROCESSING
(SYSTEMS AND SIGNAL PROCESSING)

Time: 3hours        Max.Marks:60
Answer any five questions
All questions carry equal marks

1. A Gaussian random signal has a mean value of 10 and variance of 25.
   a)  What is the probability that an observed value of the signal is greater than zero?
   b)  What is the probability that an observed value of the signal is greater than the twice of the mean value?
   c)  What is the probability that an observed value of the signal is greater than zero but less than or equal to the mean value?

2.a) Discuss Gaussian and Rayleigh distribution and density functions and mention the applications of each.
    b) What is noise figure and derive the expressions to calculate noise figure of three systems connected in cascade.

3. Implement AZTEC algorithm on the data \{0,-1,-1,0,1,1,0,20,40,50,20,1,-30,-20,-10,-1,0,1,0,1,1\} with \(V_{th}=10\). What are the points saved in the data array? Show all the relevant waveforms.

4.a) Discuss an algorithm to detect an inverted P wave? What does that signify?
    b) What do you mean by an accessory path way? Draw and explain a flowchart to detect it?

5.a) Discuss about heart rate variability analysis.
    b) Discuss about Noise Cancelling Method to Enhance ECG Monitoring.

6.a) What are salient features of prony’s method and explain in detail?
    b) Discuss the importance and how to detect alpha, beta and gamma waves.

7. Write short note on:
   a) Signal averaging technique and give an example.
   b) Data polishing technique and give an example.

8.a) Why is an EEG signal described in statistical terms? Explain.
    b) Discuss about detection of spikes and spindles.

***************
Answer any five questions  
All questions carry equal marks

---

1.a) Define density function of Rayleigh function and discuss its features.  
b) List out any two properties of distribution function.  
c) Give the condition for the density function to be valid.  
d) Explain the Law of addition of probability.

2.a) Explain stationary random processes with an example.  
b) Write the Properties of Characteristic function.

3.a) Explain the principle of operation of the Turning point algorithm.  
b) Draw and explain the flowchart for AZTEC Algorithm.

4.a) Explain about QRS detection method.  
b) Explain about automated ECG analysis.

5.a) Explain the principles of Adaptive noise cancellation.  
b) Discuss about Adaptive Noise Cancellation using LMS Adaptation Algorithm.

6.a) How does prony’s method analyze the visual evoked signals?  
b) Draw the exponential waveforms of visual evoked potential.

7.a) Give a typical sketch of EEG signal for different stages of sleep and explain the same.  
b) Discuss about inverse filtering.

8.a) Discuss about detection of Alpha, Beta and Gamma Waves.  
b) Explain about auto regressive modelling.

---
Code No: 5193F

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech I Semester Examinations, April - 2015
BIOMEDICAL SIGNAL PROCESSING
(Systems and Signal Processing)

Time: 3hrs  Max.Marks: 60

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 8 marks and may have a, b, c as sub-questions.

PART - A

5 x 4 Marks = 20

1.a) What is meant by Ergodicity?
b) What are the advantages and disadvantages of Huffman Coding?
c) Give an account of the salient ECG parameters and their intervals.
d) Explain the analysis of Evoked Potentials.
e) Discuss about Sleep Stage Analysis.

PART - B

5 x 8 Marks = 40

2.a) What is meant by Autocorrelation? Obtain the relation between Autocorrelation and Power Spectral density.
b) Stationary random process has the following autocorrelation function
   \[ R_x(\tau) = \sigma^2 e^{-\mu \tau} \] where \( \mu \) and \( \sigma^2 \) are constants. It is passed through a filter whose
   impulse response is \( h(\tau) = \alpha e^{-\tau^2} \). Here \( \alpha \) is a constant and \( u(\tau) \) is a step function. Find the spectral power density of random signal \( x(t) \). \[ 4+4 \]

OR

3.a) Obtain the Noise Bandwidth of a Band Pass filter
b) Determine the Noise Equivalent Bandwidth of RC low pass filter (LPF) whose
   transfer function or frequency response is given by \( H(f) = \frac{1}{1+j2\pi fRC} \). \[ 4+4 \]

4. After applying the AZTEC algorithm to a signal, the saved data array is
   \( \{2, 50, -4, 30, -6, 50, -6, 30, -4, 50, 2, 50\} \).
a) Draw the waveform that AZTEC would reconstruct from these data.
b) What is the amount of data reduction?
c) What is the peak-to-peak amplitude of a signal reconstructed from these data? \[ 3+3+2 \]

OR

5. For the given data set \( \{1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 6, 6, 7\} \)
   Derive the codewords for the data using Huffman coding. What is the codeword length (average codeword length)? Also depict the merging operation in a binary tree. \[ 8 \]
6.a) Explain a real time algorithm for QRS detection. Explain how heart rate is measured using R-R interval using the same algorithm.
   b) Discuss about Rhythm Analysis.

   OR

7.a) What are the principles of Adaptive Noise Canceller
   b) Explain about Adaptive Noise Cancelling with the LMS Adaptation Algorithm.

8.a) Mention the characteristics of noise and signal in signal averaging techniques.
     Explain typical signal average with the help of block diagram.
   b) Show that signal averaging improves the SNR by a factor of \( \sqrt{m} \), where \( m \) is the number of sweeps considered. What are the limitations of signal averaging?

   OR

9. Discuss about analysis of evoked potentials.

10. What is the method to detect the presence of the \( \beta \) rhythm in an EEG channel?
    How is it extended to detect the presence of the same rhythm simultaneously in two channels?

    OR

11. Discuss about Least Squares and Polynomial Modeling of EEG Signals.
ADVANCED DATA COMMUNICATIONS
(ELECTIVE – II)

UNIT -I:
Digital Modulation Schemes: BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Band Width Efficiency, Carrier Recovery, Clock Recovery.

UNIT -II:

UNIT -III:
Error Correction: Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code
Data Link Control: Line Discipline, Flow Control, Error Control

UNIT -IV:
Multiplexing: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, DSL.
Local Area Networks: Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.
Metropolitan Area Networks: IEEE 802.6, SMDS
Switching: Circuit Switching, Packet Switching, Message Switching.
Networking and Interfacing Devices: Repeaters, Bridges, Routers, Gateway, Other Devices.

UNIT -V:
Multiple Access Techniques: Random Access, Aloha- Carrier Sense Multiple Access (CSMA)-Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access-Reservation- Polling- Token Passing, Channelization, Frequency- Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA),OFDM and OFDMA.

TEXT BOOKS:

REFERENCE BOOKS:
1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
<table>
<thead>
<tr>
<th>S.No</th>
<th>Subject</th>
<th>Text Book Title</th>
<th>Chapters In Text Book</th>
<th>Units / Topics Covered</th>
<th>Author</th>
<th>Publishers &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Advanced Data Communications</td>
<td>Modern Digital Signal Processing</td>
<td>Chapter 2</td>
<td>Unit-I</td>
<td>Wayne Tomasi</td>
<td>Prentice Hall India 6th Edition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chapter 1,2,6</td>
<td></td>
<td>Unit-II</td>
<td>B. A. Forouzan</td>
<td>McGraw-Hill 2nd Edition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chapter 14,8</td>
<td></td>
<td>Unit-IV</td>
<td>B. A. Forouzan</td>
<td>McGraw-Hill 2nd Edition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data Communications &amp; Networking</td>
<td>Chapter 9,10,11</td>
<td>Unit-III</td>
<td>B. A. Forouzan</td>
<td>McGraw-Hill 2nd Edition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The design of the UNIX Operating Systems</td>
<td>1,15</td>
<td>I,II,III,IV,IV,IV</td>
<td>Maurice J.Bach</td>
<td>1986, PHI</td>
</tr>
</tbody>
</table>
MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
M.Tech. I Year - I Semester, February 2016
Sub: ADVANCED DATA COMMUNICATIONS
(Systems & Signal Processing)
Roll No______________________________

Time: 3 hours Max. Marks: 75

Note: Question paper consists of 5 sections (one section for each unit) and answer five questions, choosing one question from each section. Each question carries 15 marks.

* * * * *

SECTION - I

1. Explain about 16 PSK and 16 QAM systems and compare their performance.
   (OR)
2. Define carrier recovery and explain the methods of carrier recovery in digital communication systems.

SECTION – II

3. Explain about universal asynchronous receiver transmitter (UART) in detail with neat diagrams.
   (OR)
4. Explain about TCP/IP network protocol suit and compare with OSI model.

SECTION – III

5. Explain the terms VRC, LRC, CRC and also explain how error detection and correction is done using Hamming code with an example.
   (OR)
6. Explain about the asynchronous and synchronous data link protocols.

SECTION – IV

7. Explain briefly about i) TDM ii) FDM
   (OR)
8. Explain briefly about i) Ethernet ii) Token Bus iii) Token ring

SECTION – V

9. Explain the operation of CSMA/CA with the help of a flow chart.
   (OR)
10. Explain about i) OFDM ii) OFDMA
MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
M.Tech. I Year - I Semester supplementary Examinations, Aug 2016
Advanced Data Communications
(SSP)

Roll No | 1 | 5 | N | 3 |

Time: 3 hours
Max. Marks: 75

Note: This question paper Consists of 5 Sections. Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 15 marks.

********

SECTION - I
1. Explain about QPSK and DPSK systems and compare their performance.

(OR)

2. Define Bandwidth efficiency. Compare BPSK, QPSK, 8-PSK, 8-QAM, 16-PSK and 16-QAM modulation schemes with respect to Bandwidth and Bandwidth efficiency.

SECTION - II
3. Explain about different LAN topologies and compare them.

(OR)

4. Explain about TCP/IP network protocol suit and compare with OSI model.

SECTION – III
5. a) Explain about Forward error correction. (3M).

b) For a 12-bit data string of 101100010010, determine the number of Hamming bits required, arbitrarily place the Hamming bits into the data string, determine the condition of each Hamming bit, and assume an arbitrary single bit error. (12M).

(OR)

6. Explain different error detection and correction methods used in data communication systems.

SECTION – IV
7. Explain and compare i) Frequency division multiplexing ii) Time division multiplexing

(OR)


SECTION – V
9. Explain and compare i) FDMA ii) TDMA and iii) CDMA

(OR)

10. Explain about OFDM system with diagram and also give its advantages, disadvantages and applications.

*****
Code No: 5193J

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech I Semester Examinations, February-2014
ADVANCED DATA COMMUNICATIONS
(Systems and Signal Processing)

Time: 3 Hours

Max. Marks: 60

Instructions:

i) Part A is compulsory Question for 20 marks.
ii) Part B consists of five questions with "either" or "or" pattern. The student has to answer any one. However students have to answer five questions from Part B (numbered from 2 to 6)

PART - A

(Answer all sub questions)

1. a) What is band width efficiency?
   b) What is mean by topology? Explain 2 topologies.
   c) What is flow control and when is it required?
   d) Mention applications of multiplexing.
   e) What is polling?

**5 x 4 marks = 20**

PART - B

Answer either "a" or "b" from each question, but not both

2. a) Explain 16PSK with suitable diagrams.
   OR
   b) Discuss about BPSK.

3. a) Discuss TCP/IP reference model with the help of diagram.
   OR
   b) Discuss in detail about digital data transmission.

4. a) Discuss synchronous, asynchronous protocols.
   OR
   b) What is line discipline? Explain error control.

5. a) Explain briefly about
   i) FDM  ii) TDM.
   OR
   b) Explain in detail about
   i) FDDI  ii) Bridges.

6. a) Discuss about
   i) CDMA  ii) OFDMA.
   OR
   b) Explain about
   i) FDMA  ii) CSMA/CA.
1. If a binary data is to be transmitted using the following modulation schemes, give
the procedure to generate modulated, and demodulated signals for each scheme to
retrieve the original data in AWGN channel conditions:
a) 8-PSK  
   b) 8-QAM

2.a) What are the primary functions of UART (Universal Asynchronous Receiver
Transmitter)?
   b) With suitable block diagram(s), explain how the information is transferred
      between Data Terminal Equipment (DTE) and (Data Communication Equipment
      (DCE).

3. Describe the mechanical, electrical, and functional specifications of RS-232 serial
   interface standard.

4.a) Discuss about various types of error detection methods available in data
    communication.
    b) For a 12-bit data string of 101100010010, determine the number of Hamming bits
       required arbitrarily place the Hamming bits into the data string. Also determine
       the logic condition of each Hamming bit. Assume an arbitrary single bit
       transmission error, and prove that the Hamming code will successfully detect the
       error.

5.a) With suitable frame format, discuss about SDLC synchronous protocol. Also
    explain what is meant by ‘transparency’?
    b) Determine the bit pattern for the control field of a supervisory frame sent from a
       secondary station to the primary for the following conditions: (i) Secondary is
       ready to receive (ii) it is a final frame  (iii) Secondary is confirming correct
       reception of frames 3, 4, and 5.

6.a) With suitable sketches, explain the following:
   i) circuit switching
   ii) packet switching, and
   iii) datagram.
   b) For the European E1 32 channel system with number of bits per frame is 256 and
      number of bits in the synchronizing word is 8, and a 2.048 Mbps transmission
      rate, determine the average number of bits needed to synchronize and the average
      synchronization time.
7. a) Give the comparison between FDMA, TDMA, and CDMA with suitable examples.
   b) Explain the terms: polling, and token passing.

8. Write the following:
   a) CSMA/CA
   b) Sliding window protocol.
1.a) Describe the relationship between bit rate, bandwidth, and baud rate for M-ary PSK and M-ary QAM systems. Derive the suitable expressions.

b) With suitable block diagram, explain how clock recovery is done from the received signal in digital communication systems.

2.a) Discuss about different interface standards used in data communications with suitable electrical and mechanical specifications.

b) With suitable block diagram(s), explain how the information is transferred between Data Terminal Equipment (DTE) and Data Communication Equipment (DCE).

3.a) What are the categories of Networks? Discuss about them.

b) What are the line configurations and transmission modes used in data communications? Describe them briefly.

4.a) What are the different error detection methods used in data communications?

b) Describe how vertical redundancy checking accomplishes error detection.

c) Determine the block check character (BCC) for the following data and cyclic redundancy check (CRC) – generating polynomials: \( G(x) = x^7 + x^4 + x^2 + 1 \); and \( P(x) = x^5 + x^4 + x + 1 \).

5.a) Discuss about Synchronous Data Link Communications (SDLC) protocol in detail.

b) Determine the bit pattern for the control field of a supervisory frame format sent from a secondary station to the primary for the following conditions: the secondary is ready to receive, it is the final frame, and the secondary station is confirming frames 3, 4, and 5.

6.a) List out the similarities/differences between circuit switching, packet switching, and message switching.

b) Write the following briefly: (i) PSTN (ii) Synchronous TDM

7.a) Explain the difference between the multiplexing and multiple access with suitable examples.

b) Give the important features of Polling and Token passing.

8. List out different multiple access techniques and discuss them in detail.

*****
Code No: 5193J
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech I Semester Examinations, April - 2015
ADVANCED DATA COMMUNICATIONS
(Systems and Signal Processing)

Time: 3hrs
Max.Marks: 60

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 8 marks and may have a, b, c as sub questions.

PART - A
5 x 4 Marks = 20

1. a) Define Bandwidth efficiency and state the formula used to calculate bandwidth efficiency.
b) Briefly explain the characteristics of primary network types.
c) Explain the difference between redundancy and redundancy checking.
d) What is inverse multiplexing?
e) Distinguish between TDMA – FDMA.

PART - B
5 x 8 Marks = 40

2. a) Why is it necessary to regenerate the clock at receiver in synchronous with that of transmitter? Explain the clock recovery with timing diagram.
b) Explain the concept of carrier recovery with costas loop carrier recovery circuit.

OR

3. a) Explain the operation of 8 – PSK transmitter with neat block diagram. Indicate different PAM levels used in 8 – PSK.
b) For an 8 – PSK system, operating with an information bit rate of 24 kbps, determine:
i) Baud
ii) Minimum Bandwidth
iii) Bandwidth efficiency

4. Briefly explain about TCP / IP protocol suites.

OR

5. What is the role of different layers in OSI model?

6. a) Describe Forward Error Control.
b) Describe the difference between Asynchronous and Synchronous protocols.

OR
7.a) Explain vertical redundancy checking.
7.b) Briefly describe the stop - and - wait method of flow control. [4+4]

8.a) How does TDM combine multiple signals into one. Explain with suitable diagram.
b) Four 1 – kbps connections are multiplexed together. A unit is 1 bit. Find: (i) The duration of 1 bit before multiplexing, (ii) The transmission rate of the link, (iii) the duration of a time slot and (iv) The duration of a frame. [4+4]

OR

9.a) Distinguish the merits and demerits of a circuit switching and packet switching.
b) Explain about (i) Repeaters, (ii) Bridges, (iii) Routers and (iv) Gateway. [4+4]

10.a) Discuss the difference between polling and selecting.
b) Explain about OFDM. [3+5]

OR

11. Explain the steps involved in CDMA multiplexer and demultiplexer. [8]
ADVANCED OPERATING SYSTEMS
(OFF ELECTIVE-I)

UNIT I
Real-time operating systems: Design issues, principles and case study.

UNIT II
Distributed operating system: Design issues, features and principles of working, case study.

UNIT III
Network operating system: Design issues, working principles and characteristic features, case study.

UNIT IV
Kernel development: Issues and development principles, case study.

UNIT V
Protection, privacy, access control and security issues, solutions.

TEXT BOOKS:

REFERENCE BOOKS:
   John Wiley
6. The UNIX Programming Environment – Kernighan & Pike, PE.
# COURSE COVERAGE SUMMARY

<table>
<thead>
<tr>
<th>S.N o</th>
<th>Subject</th>
<th>Text Book Title</th>
<th>Chapters In Text Book</th>
<th>Units / Topics Covered</th>
<th>Author</th>
<th>Publishers &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Advanced Operating Systems</td>
<td>Distributed Operating System</td>
<td>1,2,3</td>
<td>I,II,III,IV, V</td>
<td>Andrew S. Tanenbaum</td>
<td>1994, PHI.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The design of the UNIX Operating Systems</td>
<td>1,15</td>
<td>I,II,III,IV</td>
<td>Maurice J. Bach</td>
<td>1986, PHI</td>
</tr>
</tbody>
</table>
MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
M.Tech. I Year - I Semester, February 2016
Sub: Advanced Operating Systems
(Common to CSE & SSP)

Time: 3 hours  Max. Marks: 75

Note: Question paper Consists of 5 SECTIONS (One SECTION for each UNIT) and answer FIVE Questions, Choosing ONE Question from each SECTION. Each Question carries 15 marks.

* * * * * * *

SECTION - I

1. (a) Differentiate between RTOS and LINUX with one example to each of the difference.
(b) Explain design issues for hard bound embedded systems?

(Or)

2. (a) List and explain any 4 different types of embedded OS in detail?.
(b) Explain how the process to process calls are handled in Vxworks?

SECTION – II

3. (a) What are the issues in implementing Inter Pipe Communication?
(b) Briefly explain features of embedded UNIX operating System.

(Or)

4. (a) What are the design issues to be addressed in the design of Distributed operating systems? Give justification with your own example?.
(b) Explain features and principles of various buses used in recent systems design?

SECTION – III

5. (a) What is the importance of unmount service in MACH-OS?.
(b) What are the services provided by memory management unit of network operating system?

(Or)

6. (a) Differentiate between RTLinux and VXWORKS.
(b) List and explain features of IBM operating Systems.

SECTION – IV

7. (a) What are the design principles of UNIX kernel?
(b) Explain types of RTOS calls with example?

(Or)

8. (a) Explain various features of RTOS kernel with examples?
(b) Explain the life cycle of kernel development?

SECTION – V

9. (a) Explain Multiple Independent Levels of Security (MILS) architecture?
(b) What is kernel service? Write about its implementation methods

(Or)

10. (a) Explain about Real time scheduler?
(b) Explain how Real time scheduler helps for the protection of the data?

* * * * * * *
Code No: R15D5802-151-S

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
M.Tech. I Year - I Semester supplementary Examinations, Aug 2016
Advanced Operating Systems
(COMMON TO CSE, SSP)

Roll No 1 5 N 3

Time: 3 hours Max. Marks: 75

Note: This question paper Consists of 5 Sections. Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 15 marks.

* * * * * *

SECTION - I
1. (a) Differentiate between RTOS and MACH-OS with examples to each?
   (b) Explain design issues for soft time bound embedded systems?
   (Or)

2. (a) List and explain at least 4 different types of RTOS in detail?
   (b) Explain how semaphores are implemented in Vxworks?

SECTION – II
3. (a) What are the issues in implementing FTP over RTLinux?
   (b) Briefly explain features of QNX operating System
   (Or)

4. (a) What are the design issues to be addressed in the design of
eCOS operating systems? Give justification with your own example?
   (b) Explain features and principles of various buses used in RTLinux?

SECTION – III
5. (a) What is the importance of SMTP service in VXWORKS?
   (b) What are the services provided by REMOTE PROCEDURE CALL of
   network operating system?
   (Or)

6. (a) Differentiate between ECOS and QNX operating system
   (b) Explain features of GNU operating Systems

SECTION – IV
7. (a) What are the design principles of ECOS kernel?
   (b) Explain types of RTOS with examples?
   (Or)

8. (a) Explain various features of BERTOS kernel with examples?
   (b) Explain the design cycle of kernel development?

SECTION – V
9. (a) Explain COSCOX operating system
   (b) What is RTAI kernel service? Write about its implementation methods
   (Or)

10. (a) Explain about Real time process scheduler?
    (b) Explain how it helps for the protection of the data?

* * * * * * *
1. a) Explain about Computer Instruction Cycle with Interrupt. 
b) Explain various I/O Communication Techniques with examples. [12]

2. Explain the following filters:
a) wc  
b) egrep  
c) fgrep  
d) tr & dd. [12]

3. a) Write an algorithm for creating a file.  
b) How to create a new process in UNIX? Write an algorithm for fork () system call. [12]

4. Explain the following:  
a) Message queues  
b) Semaphores  
c) Shared memory. [12]

5. a) Explain about Multiprocessor Time sharing systems.  
b) Describe about Network Operating System. [12]

6. Explain the working of Remote Procedure Call using a stack. [12]

7. What is Mutual Exclusion? Explain Token ring algorithm to achieve Mutual Exclusion. [12]

8. What is an Atomic Transaction? Explain various Concurrency Control mechanisms. [12]

* * * * *
ADHOC - WIRELESS NETWORKS

UNIT - I:

UNIT - II:

UNIT - III:

UNIT – IV:

UNIT – V:

TEXT BOOKS:

REFERENCE BOOKS:
### COURSE COVERAGE SUMMARY

<table>
<thead>
<tr>
<th>S.No</th>
<th>Subject</th>
<th>Subject Text Book Title</th>
<th>Chapters in Text Book</th>
<th>Units / Topics Covered</th>
<th>Author</th>
<th>Publishers &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adhoc Wireless And Sensor Networks</td>
<td>Ad Hoc Wireless Networks: Architectures and Protocols</td>
<td>1,4</td>
<td>I</td>
<td>C.Siva ram Murthy and B.S.Manoj,2004</td>
<td>PHI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5,6</td>
<td>II</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7,9</td>
<td>III</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10,11</td>
<td>IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td>V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Time: 3 hours

Max. Marks: 75

Note: This question paper Consists of 5 Sections. Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 15 marks.

*****

SECTION - I

1 a) Describe about Home RF.
   b) What are the major issues and challenges that need to be considered for designing adhoc wireless system?

   (Or)

2 a) Explain the standard of HIPERLAN
   b) List out the fundamentals of wireless LAN

SECTION – II

3 a) Describe the issues in designing MAC Protocols for ad hoc wireless networks.
   b) Explain the role of directional antennas in MAC protocols.

   (Or)

4 Explain Contention - Based Protocols with reservation Mechanisms and with Scheduling Mechanisms

SECTION – III

5 a) List out various issues in designing a routing protocol for Ad hoc wireless networks
   b) Explain Routing Protocols with Efficient Flooding Mechanisms

   (Or)

6 Explain the following a) Table–Driven Routing Protocols b) On – Demand Routing Protocols

SECTION – IV

7. Explain Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks

   (Or)

8 Explain the Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks

SECTION – V

9. Explain about MAC Protocols for Sensor Networks

   (Or)

10. Draw and explain sensor network architecture

   *****
1.a) Compare and contrast infrastructure networks with adhoc networks.
   b) What are the various issues that are to be considered for wireless Internet? Explain.

2.a) What are the various issues and challenges that are to be considered to design a ad-hoc wireless system?
   b) How does the packet queueing mechanism of MACA differ from that of MACAW? Which one of them is better? Why?

3.a) What are the advantages of reservation based MAC protocols over contention based MAC protocols?
   b) Which protocol is more bandwidth efficient, RTMAC or MACA/PR? Explain.

4.a) Compare the on-demand routing protocols and the table-driven routing protocols.
   b) What are the various issues in designing a transport layer protocol for ad-hoc wireless networks?

5.a) Discuss the various TCP solutions for ad-hoc wireless networks.
   b) What are the various issues in providing QoS in ad-hoc wireless networks? Explain.

6.a) Explain the MAC protocol used in IEEE 802.11e.
   b) What are the advantages of having transmission opportunities, arbitrary inter frame space (AIFS) in the IEEE 802.11e MAC protocol?

7.a) What are the advantages of clustered architecture over a layered architecture in a sensor networks?
   b) Explain the MAC protocol for sensor network.

8. Write short notes on
   a) Home RF
   b) Transmission power management schemes in ad-hoc wireless networks.
   c) HIPERLAN standard.

*****
1. a) Can we use CSMA/CD access mechanism in wireless local area network? If no, why?
   b) What are the various approaches to improve TCP performance in the wireless domain?

2. a) Compare and contrast cellular with adhoc wireless networks.
   b) What are main issues that are to be considered to design a MAC protocol for adhoc wireless networks?

3. a) What are the advantages of MAC protocols with scheduling mechanisms? Explain.
   b) Channel quality estimation can be done both at the sender and the receiver. Which is more advantageous? Why?

4. a) What are the different challenges of routing protocol designed for adhoc wireless networks.
   b) What are the advantages of hierarchical topology based protocols? Explain.

   b) Classify the QoS solution in ad-hoc wireless and explain.

6. a) What are the various challenges in key management in Adhoc-wireless networks.
   b) Discuss the need for energy management in ad-hoc wireless networks.

7. a) What are the differences between ad-hoc wireless networks and sensor networks?
   b) Discuss the MAC protocols used in sensor network.

8. Write short notes on
   a) Wireless Application Protocol
   b) Battery management schemes in ad-hoc wireless network
   c) Mobile IP

*****
1.a) Compare the IEEE 802.11 Standard with HIPERLAN Standard.
b) Discuss about the Bluetooth Standards. [12]

2. Write about the Issues in Wireless Ad Hoc Networks. [12]

3. Explain the Contention Based Protocols with Reservation Mechanism. [12]

4. Discuss about AODV Routing Protocol with an example. [12]

5. Explain the Security in Ad Hoc Wireless Networks. [12]


7. What are the various Battery Management Schemes in Ad Hoc Wireless Networks? [12]

8.a) Write short notes on Sensor Network Architecture
b) What is the Location Discovery in Wireless Sensor Networks? [12]
1. (a) Explain the Problems in Mobile IP.
   (b) Discuss about the Wireless Application Protocols. [12]

2. Explain the MACA Protocol with an example. [12]


4. Discuss CGSR Routing protocol with an example. [12]

5. Explain TCP Over Ad hoc Wireless Networks. [12]

6. Explain the Network Layer Solutions for QoS. [12]

7. Discuss about the Need for Energy management in Wireless Ad Hoc Networks. [12]

1.a) What are the advantages of ad-hoc wireless networks? Discuss.
   b) Can we use CSMA/CD in wireless Local Area Networks? Explain.

2.a) Why do we have four address fields in IEEE 802.11 MAC as against only two in IEEE 802.3 MAC frame?
   b) What are the mechanisms used in alleviating the hidden terminal problem at the MAC layer? Explain any one of them.

3.a) Why do we use exponential back-off mechanism in MACA? What are the disadvantages of exponential back-off mechanism used in MACA?
   b) Calculate the probability of data packet collision in the MACA protocol. Assuming that $T_c$ is the control packet transmission and propagation delay, $T_n$ is the optimal maximum back-off time, $\beta$ is the percentage of ready nodes, and $R$ is the transmission range of each node.

4.a) Discuss the pros and cons of MAC protocols using directional antennas.
   b) Explain the differences in the maintenance of topology information for at least four routing protocols.

5.a) Compare the topology based and position based routing protocols.
   b) What are the major differences between the LAR1 and the LAR2 algorithms? Explain.

6.a) What are the design goals of a transport layer protocol (TCP) for ad hoc wireless networks?
   b) What are the major challenges in providing QoS in ad-hoc wireless network? How do we achieve them?

   b) Describe how an energy efficient multimedia processing and transmission can be achieved.

8.a) Explain how traditional routing protocols defined for ad hoc wireless networks are not well suited for wireless sensor networks.
   b) What are the advantages of a clustered architecture over a layered architecture in a sensor network?
1. a) What are major motivation and flexibility provided by Wireless Local Area Networks? Explain.
   b) Give a complete view of the protocol stack with various physical layers of IEEE 802.11 standard and discuss the importance of them.

2. a) Several Bluetooth devices could be connected to constitute a piconet. In a situation with many such independent piconets, each piconet follows a different frequency hopping sequence.
   i) What is the probability that two piconets use the same hopping frequency at a given time?
   ii) Does this increase with the number of piconets? Explain.
   b) What are the advantages of contention based protocols with reservation mechanisms? Discuss.

3. a) What are the various issues that affect the design of ad hoc wireless network?
   b) How does the packet queuing mechanism of MACAW differ from that of MACAW? Which one of them is better? Why?

4. a) How does directional antennas improve the performance of MAC protocol of ad-hoc wireless networks?
   b) What are the major challenges involved in designing a routing protocol for ad hoc wireless networks?

5. a) Explain how TCP in ad hoc wireless networks differ from that in infrastructure-based networks?
   b) Discuss inherent security flaws present in table driven and on-demand routing protocols.

6. a) What are the issues and challenges in providing QoS in ad hoc wireless networks?
   b) Compare and contrast the IEEE 802.11e MAC protocol with the DBASE protocol.

7. a) Discuss the importance of Battery-Aware MAC protocol.
   b) Compare the following
   i) Dynamic power adjustment policies
   ii) Distributed topology control algorithms.

8. Write short notes on
   a) Issues and challenges in designing a sensor network
   b) MAC protocols for sensor networks.
   c) Wireless Internet.
PART - A

1.a) What are the Services offered by a typical IEEE 802.11 Network.
b) What are the design goals of a MAC Protocol for an AD HOC Wireless Networks?
c) Write the characteristics of an ideal routing Protocol for an AD HOC Wireless Networks.
d) Write the classification of Transport-layer solutions.
e) Write three basic kinds of MAC protocols used in Sensor Networks.

PART - B

2. Explain the CSMA/CA mechanism in IEEE 802.11 standards.
4. Explain the HOP Reservation multiple access protocol.
5. Discuss the power control MAC protocol for an AD HOC Wireless Networks
7. Discuss the HSR protocol with examples.
8. Write about Design issues of Transport layer protocol for an ADHOC Wireless Networks.
9. a) Why does TCP not perform well in an AD HOC Wireless Networks?
b) Write the design goals of a Transport layer protocol for AD hoc Wireless networks.

---0000---
UNIT –I:
Coding for Reliable Digital Transmission and Storage: Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT –II:
Cyclic Codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT –III:
Convolutional Codes: Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority-logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT –IV:

UNIT -V:
BCH – Codes: BCH code- Definition, Minimum distance and BCH Bounds, Decoding Procedure for BCH Codes- Syndrome Computation and Iterative Algorithms, Error Location Polynomials and Numbers for single and double error correction

TEXT BOOKS:

REFERENCE BOOKS:
1. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Ed, 2009, TMH.
### COURSE COVERAGE SUMMARY

<table>
<thead>
<tr>
<th>S.No</th>
<th>Subject</th>
<th>Subject Text Book Title</th>
<th>Chapters in Text Book</th>
<th>Units / Topics Covered</th>
<th>Author</th>
<th>Publishers &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coding Theory And Techniques</td>
<td>Error Control Coding- Fundamentals and Applications</td>
<td>1,3,4</td>
<td>I</td>
<td>Shu Lin, Daniel J.Costello</td>
<td>Prentice Hall, Inc.&amp; Second Edition</td>
</tr>
</tbody>
</table>
SECTION-1
1. Consider a systematic (8,4) code whose parity check equations are
   \[ v_0 = u_1 + u_2 + u_3; \quad v_1 = u_0 + u_1 + u_2; \quad v_2 = u_0 + u_1 + u_3; \quad v_4 = u_0 + u_2 + u_3 \]
   where \( u_0, u_1, u_2 \) and \( u_3 \) are message digits and \( v_0, v_1, v_2 \) and \( v_3 \) are parity check digits. Find the generator and parity check matrices for this code. Show analytically that the minimum distance of this code is 4.

Or
2. Form a parity check matrix for the (15,11) Hamming code. Devise a decoder for this code.

SECTION-2
3. Reduce (15,11) cyclic Hamming by deleting the seven leading high order message digits. The resultant code is an (8,4) shortened cyclic code. Design a decoder for this code that eliminates the extra shifts of the syndrome register.

Or
4. Consider the polynomial \( g(x) = x^6 + 3x^5 + x^4 + x^3 + 2x^2 + 2x + 1 \)
   (i) Is this a valid generator polynomial for a cyclic code over GF(4) with block length 15?
   (ii) Find the parity check matrix \( H \).
   (iii) What is the minimum distance of this code?
   (iv) What is the code rate of this code?
   (v) Is the received word \( v(x) = x^8 + x^5 + 3x^4 + x^3 + 3x + 1 \) a valid codeword?

SECTION-3
5. Determine a systematic encoder transfer function matrix equivalent to
   \[ G(x) = \begin{bmatrix} 1 + x & x & 1 \\ x^2 & 1 & 1 + x + x^2 \end{bmatrix} \]
   Or
6. For \( R=1/2 \) convolutional encoder with \( G(x) = [1+x^2+x^3 \ 1+x+x^3] \)
   (a) Draw hardware realization of the encoder
   (b) Determine the convolutional generator matrix \( G \)
   (c) For the input sequence \( m= [1,0,1,1,0,1,1] \), determine the coded output sequence
   (d) Draw the state diagram.
   (e) What is \( d_{\text{free}} \)?
SECTION - 4

7. Consider the Iwadare-Massey code with n=2 and λ=4. [15M]
   (a) Find m;b and g for this code.
   (b) Find the generator polynomial g^{(1)}(D)
   (c) Find the repeat distance of the information error bit e_i^{(0)}
   (d) Draw the complete encoder / decoder block diagram for this code.

Or

8. Consider the Berlekamp-preparata code with n=3 [15M]
   (a) Find m,b and g for this code
   (b) Find B_0 matrix
   (c) Find generator parity g_1^{(2)}(D) and g_2^{(2)}(D)
   (d) Find H_0 matrix
   (e) Draw encoder /decoder block diagram for this code.

SECTION - 5

9. The double error correcting BCH code of length 31 constructed by using Galois field GF(2^5)
   generated by p(x) = 1+x^2+x^5. Decode the received polynomials r_1(x) = x^7+x^30 and r_2(x) =
   1+x^{17}+x^{28}. [15M]

Or

10. Let l_o = -t and d = 2t+2. Obtain a BCH code of designed distance 2t+2 whose generator
    polynomial has β^{-t}, ......β^{-1}, β^0, β^t, ......β^t and their conjugates as all its roots.
    (a) Show that this code is a reversible cyclic code.
    (b) Show that if t is odd, the minimum distance of this code is atleast 2t+4. [15M]
1. a) What are the properties of prefix codes?
   b) Why source coding is required?
   c) Find the entropy of the source transmitting four symbols with probabilities of 0.4, 0.2, 0.2, 0.2?

2. a) Design a Shannon-Fano coding for the following symbols and their probabilities
   a a a a
   1 2 3 4
   0.5, 0.2, 0.2, 0.05, 0.05
   b) Write Lempel – Ziv algorithm.

3. Consider an (8, 4) systematic code whose parity check matrix is
   \[ H = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 & 1 \end{bmatrix} \]
   (i) Express the syndrome bits in terms of the received word bits.
   (ii) Construct the syndrome circuit for this code.
   (iii) Construct the standard array of this code.

4. a) Show that Hamming codes achieve the Hamming bound.
   b) A fairly good linear code of length \( n = 63 \) with the minimum distance \( d_{\text{min}} = 5 \) is desired.
      (i) Determine the range of parity check bits.
      (ii) Find the largest possible value of \( k \).

5. Consider the (7, 4) cyclic hamming code generated by \( g(x) = 1 + x + x^3 \). The \( r(x) \)
   is fed into the syndrome register from the right end.
   (i) What is the syndrome when a single error occurs at the location \( e(x) = x^6 \)?
   (ii) Derive the decoding circuit for this code.

6. For the (3,1) systematic convolution code with \( m = 5 \), the generator sequences are
   given as \( g^{(1)} = (100000) \), \( g^{(2)} = (101101) \) and \( g^{(3)} = (11011) \)
   (i) Find the generator matrix of this code?
   (ii) Find the code word corresponding to the information sequence
        \( d = (1101) \)?

7. a) Write a stack sequential decoding algorithm for convolution codes.
    b) Draw the code tree for (3, 1, 2) code with \( L = 5 \) and decode the sequence.
       \( r = (010, 010, 001, 110, 100, 101, 011) \)

8. Determine the generator polynomial of all the primitive BCH codes of length 31.
   Use the Galois field \( GF(2^5) \) generated by \( p(x) = 1 + x^2 + x^5 \).
1. a) Determine the differential entropy for Gaussian random variable.
   b) Suppose that $x$ is a random variable taking one of $M$ possible values. What is the entropy of $x$, assuming that all $M$ values are equally likely?
   c) Discuss the error control strategies briefly. [12]

2. a) Let $C$ be a linear code with both even – weight and odd – weight code vectors. Show that the number of even weight code vectors are equal to the number of odd – weight code vectors.
   b) Draw the Decoding circuit for $(7, 4)$ linear block code and explain its working.
   c) Find the weight enumerator for the $(7, 4)$ Hamming code. [12]

3. a) Draw the Encoding circuit for an $(n, k)$ cyclic code with generator polynomial $g(x) = 1 + \frac{x^i}{2} + \frac{x^j}{2} + \frac{x^{n-1}}{2} + \frac{x^n}{2}$ and explain it.
   b) Prove that an $(n, k)$ cyclic code is capable of detecting. [12]

4. a) Draw the error – trapping Decodes for cyclic codes and explain the decoding process.
   b) Determine the generator polynomial of all the primitive BCH codes of Length 31. Use the Galor’s field GF $(2^5)$ generated by $P(x) = 1 + x^2 + x^5$. [12]

5. a) Explain the process of one – step majority – Logic Decoding.
   b) Determine the weight enumerator for the dual of the extended Hamming code. [12]

6. a) Show that if an $(n, k)$ cyclic code is designed to connect all burst errors of length $\ell$ or less and simultaneously to detect all $d \geq \ell$ or less, the number of parity – check digits of the code must be at least $\ell + d$.
   b) Draw the block diagram of error – trapping decoder for burst – error correcting codes and explain its decoding procedure. [12]

7. a) Write Viterbi Algorithm and also give its application.
   b) Draw the code tree for a $(3, 1, 2)$ code with $L=5$ and identify the code word path for $r$.
      
      $$r = (0.10, 010, 001, 110, 100, 101, 011)$$
   [12]

8. a) Phased Burst Error correcting convolution codes
   b) Bounds on Burst error correcting capabilities. [12]
1.a) Explain the classification of error control coding strategies based on the nature of errors that they can correct. State the generic issues associated with each in terms of code rate, decoding complexity and error protection capability.

b) Consider the 1-to-5 channel code $C(p)$ over a binary symmetric channel with transition probability 0.05. The encoder does the following: $0 \rightarrow 00000$ and $1 \rightarrow 11111$ and the decoder uses majority logic decoding. Compute the bit error rate of this code.

c) Given a code with parity check matrix $H$, show that the coset with syndrome $s$ contains a vector of weight $w$ if and only if some linear combinations of $w$ columns of $H$ equals $s$. 

2. The generator matrix for a code over $GF(2)$ is given by

$$
\begin{bmatrix}
1 & 0 & 1 & 0 & 1 & 1 \\
0 & 1 & 1 & 1 & 0 & 1 \\
0 & 1 & 1 & 0 & 1 & 0
\end{bmatrix}
$$

i) Find the generator matrix and the parity-check matrix for an equivalent systematic code.

ii) List the vectors in the orthogonal complement of the code

iii) Form the standard array for this code

iv) How many code words are there of weights 0, 1, 2, 3, 4, 5, 6?

v) Find the codeword with 101 as information symbols. Decode the received word 111001.

3.a) The polynomial $g(x) = x^4 + x + 1$ is the generator polynomial for the (15,11) Hamming binary code.

i) Determine the generator matrix of this code in systematic form.

ii) Determine the generator polynomial for the dual code.

b) Let $g(x) = x^8 + x^6 + x^4 + x^2 + 1$ be a polynomial over the binary field.

i) Find the lowest rate cyclic code whose generator polynomial is $g(x)$

ii) What is the rate of this code?

iii) Find the minimum distance of this code.

Contd…..2
4. The cyclic binary code defined by the generator polynomial
\[ g(x) = x^4 + x^3 + x^2 + 1 \]
correct bursts of length 2.

i) What are the block-length and rate of this code?

ii) Find the minimum distance of the code.

iii) Design a systematic encoder for the code.

iv) Design an error-trapping decoder that will correct bursts of length 2. [12]

5. The minimal polynomials of the elements of GF(2^4) generated by the polynomial
\[ x^4 + x + 1 \]
are given below.

<table>
<thead>
<tr>
<th>Conjugate Roots</th>
<th>Minimal Polynomials</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>x</td>
</tr>
<tr>
<td>1</td>
<td>x + 1</td>
</tr>
<tr>
<td>( \alpha, \alpha^2, \alpha^4, \alpha^8 )</td>
<td>( x^4 + x + 1 )</td>
</tr>
<tr>
<td>( \alpha^3, \alpha^6, \alpha^9, \alpha^{12} )</td>
<td>( x^4 + x^3 + x^2 + x + 1 )</td>
</tr>
<tr>
<td>( \alpha^5, \alpha^{10} )</td>
<td>( x^2 + x + 1 )</td>
</tr>
<tr>
<td>( \alpha^7, \alpha^{11}, \alpha^{13}, \alpha^{14} )</td>
<td>( x^4 + x^3 + 1 )</td>
</tr>
</tbody>
</table>

Design a (15,7,5) BCH code by choosing suitable minimal polynomials. For this code, decode the received code vector 101010110010101. [12]

6. A convolutional code is described by \( g_1 = [1 0 1], g_2 = [1 1 1], g_3 = [1 1 1] \)

i) Draw the encoder corresponding to this code

ii) Draw the state transition diagram for this code

iii) Find the transfer function, free distance and length of the minimum distance path corresponding to this encoder.

iv) This convolutional encoder is used for transmission over an AWGN channel with hard-decision decoding. The output of the demodulator is [101001011101111…]. Using the Viterbi algorithm, find the transmitted sequence. [12]

7.a) Design an encoder for a systematic, noncatastrophic, binary (16,4) convolutional code with minimum distance \( d^* = 9 \) and constraint length \( v = 3 \). What is the free distance of this code?

b) Find a systematic feedback shift-register encoder for the binary convolutional code with generator matrix of polynomials? [12]

\[ G(x) = \begin{bmatrix} x & x^2 & 1 \\ 0 & 1 & x \end{bmatrix} \]

8.a) Find \( g(x) \) for a binary double-error-correcting code of blocklength \( n = 31 \). Use a primitive \( \alpha \) and the primitive polynomial
\[ p(x) = x^5 + x^2 + 1 \]

b) Explain how the convolutional encoding scheme is able to handle burst errors with the help of a suitable interleaver. What are the strategies used for the design of interleavers? [12]
1. a) Derive the condition for the Maximum entropy of a Discrete Source transmitting three messages, independent of each other, with probabilities $P_1$, $P_2$ and $P_3$. Find the value of the Maximum Entropy.

b) Verify that the Mutual Information $I(X, Y) = H(X) - H(X|Y)$, where $X$ and $Y$ are the Transmitter and Receiver respectively, and $H$ is the Corresponding Entropy.

2. a) What is a Binary Symmetric Channel? Explain.

b) Find the Hamming Distance of the (5, 3) Linear Block Code with the Generator Matrix is

3. a) Find the Standard Array for a (6, 3) Linear Block Code, whose generator matrix is

b) Find the syndrome matrix of the block code.

4. Design a Systematic Cyclic Encoder for a (7, 3) code, with a generator polynomial $g(x) = x^4 + x^3 + x^2 + 1$ and find the code word for the data word 110.

5. Construct the decoding Table for a single error correcting (7, 4) Cyclic code, whose generator polynomial is $g(x) = x^3 + x^2 + 1$.

6. Find and plot the State Diagram of the following Convolutional Encoder.

7. a) Explain about the Principle of Maximum Likelihood Decoding of Convolutional Codes.

b) Discuss about Convolutional Interleaving.

8. Generate the Field elements of $GF(2^3)$, whose irreducible polynomial is $x^3 + x + 1$. 

**********
Code No: 5193L

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech II Semester Examinations, August-2014
CODING THEORY AND TECHNIQUES
(Systems and Signal Processing)

Time: 3 Hours
Max. Marks: 60

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 8 marks and may have a, b, c as sub questions.

PART - A
5 x 4 marks = 20

1. The output of an analog source, band limited to 2 KHz, is sampled at a rate of 6 KHz. The samples of the source are quantized into 4 levels Q₁, Q₂, Q₃ and Q₄. These levels occur with respective probabilities of 1/2, 1/4, 1/8 and 1/8. Find the entropy of the source in bits per second.
   
2. Design the encoder for a systematic (8,5) Cyclic code with a generator polynomial of 1+X+X²+X³.

3. Define:
   i) Impulse Response of a Convolutional Encoder
   ii) Soft Decision and Hard Decision.

4. Explain the principle of Block Interleaving.

5. Write the properties of Syndrome Vector of an (n, k) Linear Block Code.

PART - B
5 x 8 marks = 40

2. A Binary Source transmits equally likely 0’s and 1’s at a rate of 1000 symbols per second. The Source is connected to a communication channel, with a transition probability \( p \begin{pmatrix} 0 \\ 1 \end{pmatrix} = 0.4; p \begin{pmatrix} 1 \\ 0 \end{pmatrix} = 0.3 \). Find the rate of information transmission over the channel.

OR

3. Find the Standard Array for a (6,3) Linear Block Code, whose generator matrix is

\[
\begin{bmatrix}
1 & 0 & 0 & 0 & 1 & 1 \\
0 & 1 & 0 & 1 & 1 & 1 \\
0 & 0 & 1 & 1 & 1 & 0
\end{bmatrix}
\]

4. Design a Systematic Cyclic Encoder for a (7,3) code, with a generator polynomial \( g(x) = x^4 + x^3 + x^2 + 1 \) and find the code word for the data word 010.

OR

5. Find the systematic Cyclic Code word for the message word 1 0 1, using the polynomial division when the generator polynomial \( g(x) = 1 + X + X^2 + X^4 \).
6. Find and plot the State Diagram of the following Convolutional Encoder.

```
<table>
<thead>
<tr>
<th>V1</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
```

OR

7. A 1/3 convolutional Code has generators \( g_1 = [0 \ 1 \ 1] \); \( g_2 = [1 \ 0 \ 1] \); \( g_3 = [1 \ 1 \ 1] \). Draw the encoder circuit of the corresponding encoder and find the code word for the Message Sequence 110110.

8. The generator Polynomial for a (15,7) cyclic code is \( g(x) = 1 + x^4 + x^6 + x^7 + x^9 \). When the code vector for the message polynomial \( d(x) = x^2 + x^3 + x^4 \) is transmitted, if the first and last bits of the received are in error, find the corresponding Syndrome Vector.

OR

9. a) Consider a (15,9) cyclic code generated by \( g(x) = 1 + x^3 + x^4 + x^5 + x^6 \). Find the Burst Error correcting capability and Burst Error Correcting efficiency of the code.

b) A (15,5) Linear Systematic Cyclic Code has a generator Polynomial \( g(x) = 1 + x + x^2 + x^4 + x^5 + x^6 \). Draw the encoder and Syndrome Calculator for this code.

10. Verify whether the following polynomials are either irreducible or primitive.
   a) \( p(x) = x^4 + x^3 + x + 1 \)  
   b) \( x^2 + x + 1 \)  
   c) \( x^3 + x^2 + 1 \).

OR

11. Generate the Field elements of \( \text{GF}(2^3) \), whose irreducible polynomial is \( x^3 + x + 1 \).
MULTIRATE SIGNAL PROCESSING

Unit-I
Fundamentals of Multirate Theory: The sampling theorem - sampling at sub-Nyquist rate - Basic Formulations and schemes. Basic Multirate operations- Decimation and Interpolation - Digital Filter Banks- DFT Filter Bank- Identities- Poly-phase representation (c) Maximally decimated filter banks: Poly-phase representation, Errors in the QMF bank, Perfect reconstruction (PR) QMF Bank, Design of an alias free QMF Bank.

Unit-II
M-channel perfect reconstruction filter banks: Uniform band and non uniform filter bank - tree structured filter bank- Errors created by filter bank system- Poly-phase representation- perfect reconstruction systems –

Unit-III

Unit-IV
Cosine Modulated filter banks: Cosine Modulated pseudo QMF Bank- Alas cancellation- phase -Phase distortion- Closed form expression- Poly-phase structure- PR System

Unit-V
Introduction to Wavelet Transforms: Short time Fourier Transform, Cabor Transform, Wavelet Transform, Recursive multi resolution decomposition, Haar wavelet, Digital Filter implementation of the Haar wavelet.

TEXT BOOKS:

REFERENCE BOOKS:
<table>
<thead>
<tr>
<th>S.No</th>
<th>Subject</th>
<th>Subject Text Book Title</th>
<th>Chapters in Text Book</th>
<th>Units / Topics Covered</th>
<th>Author</th>
<th>Publishers &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Multirate Signal Processing</td>
<td>Modern Digital Signal Processing</td>
<td>1,2,3</td>
<td>I</td>
<td>Robert Cristi</td>
<td>Thomson Books,2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Multirate Digital Signal Processing</td>
<td>4,5</td>
<td>II</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td>IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>V</td>
<td>Robert Cristi</td>
<td>Thomson Books,2004</td>
</tr>
</tbody>
</table>
MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
M.Tech. I Year - II Semester Regular Examinations, Aug 2016
Multirate Signal Processing
(SSP)

Roll No

| 1 | 5 | N | 3 |

Time: 3 hours Max. Marks: 75

Note: This question paper Consists of 5 Sections. Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 15 marks.

SECTION - I

1. Show that the decimator and expander are time variant systems?
   (Or)

2. Write about PR QMF filter banks

SECTION – II

3. Explain the errors created in the QMF bank.
   (Or)

4. Explain tree structured QMF filter banks

SECTION – III

5. Explain M-Channel FIR Paraunitary Filter bank
   (Or)

6. Discuss two channel FIR paraunitary QMF bank.

SECTION – IV

7. Explain Cosine modulated perfect Reconstruction system.
   (Or)

8. Write the advantages of cosine modulated PR system

SECTION – V

9. What is MRA? Explain the significance of it in wavelet transforms.
   (Or)

10. Write short notes on
    (a) Recursive multi resolution decomposition
    (b) Digital Filter implementation of the Haar wavelet.

   * * * * * * * * *
Sample Question Paper

MULTIRATE SIGNAL PROCESSING

Answer any five of the following questions:— 5X20=100

1. (a) From the fundamentals of Multirate Signal Processing, develop a Digital Filter Bank with all necessary expressions for Filter Response.
   (b) Represent Noble Identities in detail with an example.

2. (a) Design a QMF Bank and also analyze the errors present in QMF Bank.
   (b) Illustrate with the required expressions how Reconstruction of the signal takes place in QMFBank.

3. (a) Compose the two popular Interconnections of Decimator and Interpolator, Justify your answer with an example.
   (b) Interpret the purpose of using a Decimator and an Interpolator in an Audio System?

4. (a) State and prove sampling theorem. Discuss about Nyquist rate and Aliasing phenomena In detail.
   (b) Compare and Contrast Uniform and Non uniform filter banks with neat block diagrams.

5. (a) Perform Poly phase Analysis for Multirate Signal Processing.
   (b) Illustrate Perfect Reconstruction in QMF Bank with neat block diagram.

6. (a) Discuss about Linear Phase PR Filter Banks in detail.
   (b) Discuss about Quantization effect, and types of quantization effects in filter banks.

7. (a) Analyze Cosine modulated QMF bank Systems with neat block diagram.
   (b) Discuss about Alias Cancellation in Cosine modulated QMF Banks.

8. Discuss about coefficient sensitivity effects, dynamic range and scaling in Perfect Reconstruction Filter Banks.
EMBEDDED REAL TIME OPERATING SYSTEMS
(ELECTIVE -III)

UNIT –I:
Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,( open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec.

UNIT -II:

UNIT -III:

UNIT -IV:

UNIT -V:
Case Studies of RTOS: RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, Tiny OS and Android OS.

TEXT BOOKS:

REFERENCE BOOKS:
3. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh.
### COURSE COVERAGE SUMMARY

<table>
<thead>
<tr>
<th>S.No</th>
<th>Subject</th>
<th>Subject Text Book Title</th>
<th>Chapters in Text Book</th>
<th>Units / Topics Covered</th>
<th>Author</th>
<th>Publishers &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Embedded RTOS</td>
<td>Advance D UNIX Programming</td>
<td>1,2</td>
<td>I</td>
<td>RICHARDST EVENS</td>
<td>PHI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3,4</td>
<td>II</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.REAL TIME SYSTEMS</td>
<td>4</td>
<td>III,IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VX WORKS PROGRAMMERS GUIDE</td>
<td>5</td>
<td>V</td>
<td>C.M.KRIS TMH SYSTEMS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>HNA, KANG G.SHIN</td>
<td></td>
</tr>
</tbody>
</table>
MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
M.Tech. I Year - II Semester Regular Examinations, Aug 2016
Embedded RTOS
(Common to CSE, SSP)

Roll No

| 1 | 5 | N | 3 |   |

Time: 3 hours
Max. Marks: 75

Note: This question paper Consists of 5 Sections. Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 15 marks.

* * * * * *

SECTION - I
1. Explain with example how to work with Files and Directories? And briefly discuss Informational Commands
   (Or)
2. Explain How is GUI different from the CLI? Explain Linux Directory with examples

SECTION – II
3. Explain the process of scheduling? and also explain queuing management
   (Or)
4. Explain how Resource management can be handled?

SECTION – III
5. Compare Character-Mode vs. Block-Mode Devices
   (Or)
6. Explain Typical Event Register Operations in RTOs

SECTION – IV
7. Explain the Nature of Spurious Interrupts? How Soft-Timer Facility can be Handling?
   (Or)
8. Explain Programmable Interval Timers with examples

SECTION – V
9. Explain TinyOS Architecture Overview
   (Or)
10. Compare android OS With MicroC/OS-II,

*****
1. a) Write an algorithm for fork. 
   b) How many types of system calls are there for messages? Write the algorithm for Msgsnd. [12]

2. a) What is a signal in UNIX? Explain classification of different groups of signals. 
   b) Explain the necessary algorithm for attaching a shared memory. [12]

3. a) Differentiate between hard and soft real time systems. 
   b) Discuss about the temporal parameters of real time workload. [12]

4. a) Explain the necessity of RTOS in an embedded system. 
   b) Explain the weighted round robin and priority driven approaches of real time scheduling. [12]

5. a) What are the steps that almost eliminate a likely bug in program due to shared data problem? 
   b) Discuss about priority Inversion problem and deadlock situation. [12]

6. What are the goals of operating system services? Discuss process management in detail. [12]

7. a) Discuss different ways of responding to a hardware resource call on interrupts.
   b) What are the salient features of μcos? [12]

8. a) What are the important functions present in kernelLib.h of Vxworks. 
   b) Create a mutex semaphore using Vx works. [12]

****
M.Tech I Semester Regular Examinations March/April 2010

EMBEDDED & REAL TIME SYSTEMS
(DIGITAL ELECTRONICS & COMMUNICATION SYSTEMS)

Time: 3 hours
Max. Marks: 60

Answer any five questions
All questions carry equal marks

1. Discuss about any four synthesis design Technologies.

2.a) What is meant by Hardware/Software co-simulation. Explain?
b) Discuss about Priority inversion problem?
c) Give the main features of Embedded Linux?

3.a) What are message queues? How to implement them?
b) Explain the concept and implementation mechanism of pipes and signals?

4.a) Explain Scheduling algorithms of Embedded Task Scheduler?
b) Discuss about semaphores and mutex?

5.a) What are concurrent processes? Explain how embedded software should deal concurrent processes?
b) How to deal synchronization problems among processes? Explain with specific algorithms?

6.a) Discuss about Digital Signal Processor?
b) Discuss basic features and frame format of Ethernet?

7. Write short notes on the following:
i) RT-level Combinational logic.
ii) Optimization of custom single purpose processors.
iii) Goals of Embedded system.

8. Write short notes on:
i) Features of Real time OS.
ii) Blue tooth.
iii) PSM-model.

---00o---
1. Explain the ARM processor, memory organization and instruction level parallelism.

2. a) Write a short notes on semaphore and queues.
    b) Explain the I2C bus and CAN bus.

3. Write a short note on
   a) Serial data communication
   b) Multiple interrupts.

4. Explain the embedded computing and embedded system design process.

5. What is meant by microprocessor and explain in detail the architecture of 8051 Microprocessor?

6. What are the various data transfer and logical instructions?

7. a) What is an interrupt?
    b) Explain the JUMP and CALL instructions.
    c) Arithmetic operation instructions.

8. a) Discuss about task and task states in Real-Time operating systems.
    b) Explain the memory management in RTOS environment.
1. Explain hard real time systems vs. software real time systems with suitable examples.

2. Write short notes on
   a) vfork       b) wait  c) fork    d) exit.

3. Explain functional parameters with one suitable example.

4. a) What are the advantages and disadvantages of disabling interrupts during the running of a critical section of process?
    b) How does the card communicate with the host using the sockets?

5. Show then use of 15 points for the principles of RTOS based design by taking the example of digital camera.


7. a) Draw the state diagram of TCP stark generation.
    b) Why are the list of tasks and synchronization model required before using RTOS functions?

8. a) Why is Java popular for smartcard applications?
    b) Explain product design life cycle.

*****
1. Explain Inter process communication.

2. Write short notes on
   (a) Execution time
   (b) A periodic task

3. Explain all functional parameters with examples.

4.a) What are the parameters of a TCB of a task?
   b) What is meant by a pipe? How does a pipe differ from a queue?

5. Show the use of 15 points for the principles of RTOS-based design by taking the example of mobile phone device.

6.a) How do you set OS ENTER CRITICAL() and OS EXIT CRITICAL()?
   b) Explain the use of file descriptor for I/O devices and files.

7.a) Draw the state diagram of ACVM functions.
   b) Why is the I/O instructions platform dependant? Define throughput of an I/O system.

8.a) How does calling of an interrupt routine help in testing a design?
   b) Describe performance – acceleration methods.

--ooOoo--
MOBILE COMPUTING TECHNOLOGIES  
(ELECTIVE - IV)

Unit – I: Introduction to Mobile Computing Architecture

Unit – II: Cellular Technologies: GSM, GPS, GPRS, CDMA and 3G

Unit – III: Wireless Application Protocol (WAP) and Wireless LAN

Intelligent Networks and Interworking
Introduction – Fundamentals of Call processing – Intelligence in the Networks – SS#7 Signaling – IN Conceptual Model (INCM) – softswitch – Programmable Networks – Technologies and Interfaces for IN

Unit – IV: Client Programming, Palm OS, Symbian OS, Win CE Architecture

J2ME

Unit – V: Voice over Internet Protocol and Convergence

Security Issues in Mobile Computing

TEXT BOOKS:

REFERENCES:
## COURSE COVERAGE SUMMARY

<table>
<thead>
<tr>
<th>S.No</th>
<th>Subject</th>
<th>Subject Text Book Title</th>
<th>Chapters in Text Book</th>
<th>Units / Topics Covered</th>
<th>Author</th>
<th>Publishers &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobile Computing</td>
<td>Mobile Computing-Technology, Applications and Service Creation</td>
<td>1,2</td>
<td>I</td>
<td>Creation Asoke Ktalukder, Roopa R Yavagal, 2009</td>
<td>TMH</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4,5,6,7,9</td>
<td>II</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10,11</td>
<td>III</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12,13,14,15,16</td>
<td>IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>17,20</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computer and Communication Networks</td>
<td></td>
<td>2,3</td>
<td>I</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4,5,7</td>
<td>II</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8,9</td>
<td>III</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16,18,19,20</td>
<td>V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Explain the process of dialog control and security considerations in mobile computing networks and the applications in mobile computing.

(Or)

2. What is mobile computing over IP protocol? Explain the architectural features of mobile computing networks.

SECTION – II

3. Explain the features of Bluetooth communication protocol and its architecture. What is piconet and explain the process of extending a Bluetooth piconet.

(Or)

4. Explain the architecture of GSM and its entities. What is the process of authentication in GSM network? Compare CDMA and GSM Networks.

SECTION – III

5. Explain the following
   (a) MMS
   (b) WINDOWS-CE Architecture
   (c) PDA

(Or)

6. Explain the following
   (a) SS7 signalling
   (b) Soft switch
   (c) X.25 networks.

SECTION – IV

7. Explain the following
   (a) Peek under the HOOD
   (b) MMS and J2ME
   (c) OOPS concepts,

(Or)

8. What is MIDP and explain the following
   (a) Operational packages in MIDP
   (b) Various Operating systems used in Mobile Phones
   (c) Frequently used hardware in mobile phones.

SECTION – V


(Or)

10. Explain the following.
    (a) SIP
    (b) Public key algorithms with example
    (c) Call routing in VOIP

**********
1. a) List and explain any two novel applications of mobile computing concept.  
   b) With a neat sketch, explain the architecture for mobile computing. [12]

2. Explain the GSM architecture with a neat diagram. [12]

3. Explain the IEEE 802.11 Standard for Wireless LAN Architecture giving the protocol stack. [12]

4. Compare and contrast the Symbian OS architecture with Palm OS architecture. Draw their architectural diagrams. [12]

5. Listing the various features supporting mobile application development, write about J2ME. [12]


7. a) Giving the architectural diagram, write about IP multimedia subsystem (IMS).  
    b) Explain the Security frameworks for Mobile Environment. [12]

8. Write short notes on:  
   a. GPRS  
   b. Mobile Voice over IP [12]

*****
Code No: D8202, D7802
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
M.Tech II SEMESTER EXAMINATIONS, OCTOBER/NOVEMBER-2012
MOBILE COMPUTING
(COMMON TO COMPUTER NETWORKS, COMPUTER NETWORKS AND INFORMATION SECURITY)

Time: 3 hours
Answer any five questions
Max. Marks: 60
All questions carry equal marks

1. a) Distinguish mobile computing paradigm from distributed computing with the help of a real-time application.
   b) State its (mobile computing) promises and impediments.

2. Giving architectural diagram for 2.5G GPRS indicating the additional hardware and software requirements to 2G GSM to support the data services too.

3. Explain how a Mobile Host (MH) communicates with a Correspondent Host (CH) using Mobile IP with a neat sketch emphasizing the COA and tunneling concepts.

4. a) Elucidate the reasons for poor performance of TCP in mobile environment.
   b) Compare and contrast the two solutions for TCP problems in mobile environment – I-TCP & S-TCP diagrammatically.

5. a) Draw the Bluetooth Protocol (Stack) architectural diagram.
   b) Explain the working of the Radio Frequency Identification (RFID).

6. a) Draw the simplified architecture supporting mobile computing concepts.
   b) Draw the functional diagram giving subsystems of GSM Protocol.

7. Write about the following:
   a) Digital Video Broadcasting (DVB)
   b) Digital Audio Broadcasting (DAB)

8. Write short notes on:
   a) Dynamic Host Configuration Protocol (DHCP)
   b) One Security Framework for Mobile Environment
   c) Wireless Broadband (WiMax)

****
Answer any five questions
All questions carry equal marks

1. a) Describe the schematic representation of a mobile environment.
b) Describe the different types of networks that are used in mobile computing.

2. a) Describe the protocol architecture of the GPRS transmission plane and its protocol stack.
b) Explain about the IP encapsulation.

3. a) Differentiate between 3G versus WiFi.
b) Explain the different types of planes that are used in ICNM.

4. a) Explain the components of Symbian application.
b) Describe the life cycle of MIDlet.

5. a) Explain about the 3GPP security architecture.
b) Explain the characteristics of mobile computing environments.

6. a) Explain the applications and services of mobile computing.
b) Explain about the Real Time protocols.

7. Give a good account of Record Management System.

8. a) Describe the signaling protocol structure in GSM.
b) Explain the different types of signal units.
UNIT – I
Linux Utilities- File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities. Bourne again shell(bash) - Introduction, pipes and redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples. Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

UNIT - II

UNIT - III
Signals- Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions. Interprocess Communication - Introduction to IPC mechanisms, Pipes- creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions, Introduction to message queues, semaphores and shared memory. Message Queues- Kernel support for messages, UNIX system V APIs for messages, client/server example. Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores.

UNIT – IV
Shared Memory- Kernel support for shared memory, UNIX system V APIs for shared memory, client/server example. Network IPC - Introduction to Unix Sockets, IPC over a network, Client-Server model ,Address formats(Unix domain and Internet domain), Socket system calls for Connection Oriented - Communication, Socket system calls for Connectionless-Communication, Example-Client/Server Programs- Single Server-Client connection, Multiple simultaneous clients, Socket options – setsockopt, getsockopt, fcntl.

UNIT-V
Network Programming in Java—Network basics, TCP sockets, UDP sockets (datagram sockets),
Server programs that can handle one connection at a time and multiple connections (using
multithreaded server), Remote Method Invocation (Java RMI)—Basic RMI Process, Implementation
details—Client-Server Application.

TEXT BOOKS:
1. Unix System Programming using C++, T.Chan, PHI.(Units II,III,IV)
3. An Introduction to Network Programming with Java, Jan Graba, Springer, rp 2010.(Unit V)
4. Unix Network Programming ,W.R. Stevens, PHI.(Units II,III,IV)

REFERENCE BOOKS:
1. Linux System Programming, Robert Love, O’Reilly, SPD.
   Education.
3. UNIX for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson
   Education.
5. Unix Network Programming The Sockets Networking API, Vol.-I,W.R.Stevens, Bill Fenner,
   A.M.Rudoff, Pearson Education.
8. C Programming Language, Kernighan and Ritchie, PHI
<table>
<thead>
<tr>
<th>S.No</th>
<th>Subject</th>
<th>Subject Text Book Title</th>
<th>Chapters in Text Book</th>
<th>Units / Topics Covered</th>
<th>Author</th>
<th>Publishers &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>II</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td>III</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Computer and Communication Networks</td>
<td>2,3</td>
<td>I</td>
<td>Nader F. Mir</td>
<td>Pearson Education, 2007</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4,5,7</td>
<td>II</td>
<td>Nader F. Mir</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8,9</td>
<td>III</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16,18,19,20</td>
<td>V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CODE NO: R15D5810-152

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
M.Tech. I Year - II Semester Regular Examinations, Aug 2016
Advanced Network Programming
(Common to CSE, SSP)

**Note:** This question paper consists of 5 Sections. Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 15 marks.

**SECTION - I**
1(a) Explain about Text processing utilities and backup utilities
(b) Explain about control structures?

(Or)

2(a) Explain about process utilities and disk utilities?
(b) Explain about file handling utilities?

**SECTION – II**
3(a) Explain about Zombie process and orphan process?
(b) Explain about lockf and fcntl functions

(Or)

4(a) Explain about symlink, link, unlink
(b) Explain about chmod, fchmod

**SECTION – III**
5(a) What are named and unnamed pipes? How are they created?
(b) Explain in detail how the IPC functionality is provided by message queues?

(Or)

6(a) Explain file locking with semaphores?
(b) Explain about signal generation and signal handling?

**SECTION – IV**
7(a) Explain ‘Gethostbyname’ function in detail?
(b) What are the differences in socket functions when using unix domain sockets?

(Or)

8(a) Explain socket system calls for connection oriented service?
(b) Discuss the uses of the following functions
(i) getservbyname (ii) getservbyport

**SECTION – V**
9(a) Describe the connection establishment handshake of TCP
(b) Discuss the uses of the following TCP socket options
(i) TCP_MAXSEG (ii) TCP_NODELAY

(Or)

10(a) Explain with a sample code how a connected UDP socket can be used to determine the outgoing interface
(b) Explain RMI process implementation?

* * * * * * * * *