MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech II year – I Semester Examinations, Model Paper-I

SIGNALS AND SYSTEMS

Time: 3 hours **Max. Marks: 70**

Answer one question from each section.

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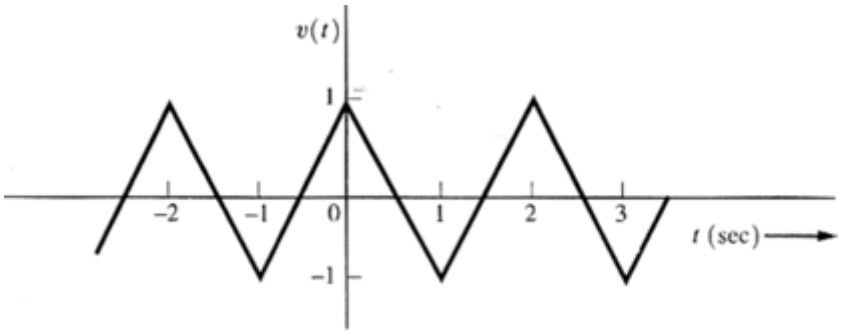
SECTION – I

1. (a) Write short notes on the following signals: [8M]
   (i) Unit step (ii) Unit impulse
   (iii) Unit ramp (iv)Signum function
   (b)Write the properties of Impulse function [6M]

(OR)

2. Find the exponential Fourier series and plot the magnitude and phase spectra of the following triangular wave form. [14M]



SECTION – II

3. State and prove following properties of Fourier transform.
   (i)Convolution in time domain [5M]
   (ii) Differentiation in time domain [5M]
   (iii) Time shifting [4M]

(OR)

4. a) When does aliasing occur? What is anti-aliasing filter? [6M]
   b) Explain various sampling methods? [8M]

SECTION – III

5. a) Define following properties of a continuous time system with simple examples.
   (i) Linearity and Non-linearity (ii) Time variance and Time invariance [6M]
   b) Examine the following systems with respect to above properties.

(i) $y(t) = \sin[x(t)]$ (ii) $y(t) = \text{sint}.x(t)$ [8M]

(OR)

6. a) Explain the filter characteristics of linear systems [7M]
   b) Obtain the conditions for distortion less transmission through a system. [7M]

SECTION – IV

7. a)Explain graphical representation of convolution with example [7M]
   b) Compare energy spectral density and power spectral density. [7M]

(OR)

8. Determine and sketch auto correlation function of a periodic signal X(t)= $A \sin(\omega_0 t + \theta)$. Also sketch its power spectral density. [14M]

SECTION – V

9. State and prove initial value theorem and final value theorem with respect to Laplace transform. [14M]

(OR)

10. Prove that the sequences $x_1[n] = a^n u[n]$ and $x_2[n] = -a^n u[-n-1]$ have same Z transform and differ only in ROC. Plot their ROCs. [14M]

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MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech II year – I Semester Examinations, Model Paper-II

SIGNALS AND SYSTEMS

Time: 3 hours **Max. Marks: 70**

Answer one question from each section.

SECTION – I

1. (a) Define and discuss various elementary continuous time signals. Indicate them graphically [10M]
   (b) What are the types of representation of discrete time signals? Represent a sequence in all types. [4M]

(OR)

2. State and prove any two properties of the Fourier series. [14M]

SECTION – II

\ 3. Obtain the Fourier transform of the following: [14M]

i. $x(t)=A\ \mathrm{Sin}\ (2\pi f_c t).\ u(t).$

ii. $x(t)=f(t).\mathrm{Cos}(2\pi f_c t+\Phi).$

(OR)

4.State and prove the following properties of Fourier transform.
(i) Multiplication in time domain. [5M]
(ii) Linearity. [5M]
(iii) Frequency shifting [4M]

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SECTION – III

5. A continuous time signal is given as: x(t) = 8 cos200πt Determine [14M]
   i.Minimum sampling rate
   ii.If fs=400Hz what is discrete time signal obtained after sampling.
   iii.If fs=150Hz what is discrete time signal obtained after sampling.

(OR)

6. Define Nyquist rate. Compare the merits and demerits of performing sampling using impulse, Natural and Flat-top sampling techniques. [14M]

SECTION – IV

7. State and Prove Properties of auto correlation and cross correlation functions? [14M]

(OR)

8. Prove that for a signal, auto correlation function and power spectral density forms a Fourier transform pair. [14M]

SECTION – V

9. Find the Laplace transform of the function

   (i) $f(t) = A \sin \omega_0 t$ for $0 < t < T/2$ [7M]

   (ii) $f(t) = e^{-at} \cos(\omega_c t + \theta)$ [7M]

   (OR)

10. Find the Laplace transform of the periodic square wave of amplitude range (-A, A) and time period 2T. [14M]

$$F(s) = \frac{17s^3 + 7s^2 + s + 6}{s^5 + 3s^4 + 5s^3 + 4s^2 + 2s}$$

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech II year – I Semester Examinations, Model Paper-III
SIGNALS AND SYSTEMS

Time: 3 hours Max Marks: 70

Answer the following Questions

SECTION – I

1. (a)What are the basic operations of signals? Illustrate with an example [10M]
   (b)Distinguish between continuous-time and discrete –time signals. [4M]

(OR)

2. Derive the expressions for the trigonometric Fourier series coefficients [14M]

SECTION – II

3. (a) State and Prove Modulation theorem. [7M]
   (b)Using the modulation theorem find out the Fourier transform of RF pulse Given as $y(t) = A\ rect(t/\tau)\ Cos\ 2\pi f_c t$. [7M]

(OR)

4. Explain sampling theorem for Band limited Signals [14M]

SECTION – III

5. (a) Explain causality and physical reliability of a system and hence give Paley-Wiener criterion. [6M]
   (b) Obtain the relationship between the bandwidth and rise time of ideal low pass Filter [8M]

(OR)

6. Distinguish between linear and non linear systems with examples and Consider a stable LTI System characterized by the differential equation $dy(t)/dt + 2y(t) = x(t)$. Find its impulse response. [14M]

SECTION – IV

7. (a) The waveform $V(t)= e^{-t}/T\ u(t)$ is passed through a high pass RC circuit having a time constant T and find the energy spectral density at the output of the circuit. [7M]

   (b)Find the cross correlation of the functions $\sin \omega t$ and $\cos \omega t$. [7M]

(OR)

8. (a) Write the Procedure to find the convolution of two signals. [7M]
   (b) Find the convolution of the following signals by graphical method. $x(t)=e^{-3t}u(t), h(t)=u(t+3)$ [7M]

SECTION – V

9. Determine the function of time x(t) for each of the following Laplace transforms And their associated regions of convergence [14M]

(OR)

10. Using the Power Series expansion technique, find the inverse Z-transform of The following X (Z) [14M]

i. $X(Z) = \frac{Z}{2Z^2-3Z+1}$ $|Z| < \frac{1}{2}$

ii. $X(Z) = \frac{Z}{2Z^2-3Z+1}$ $|Z| > 1$

(b) Find the inverse Z transform of

$X(Z) = \frac{Z}{Z(Z-1)(Z-2)^2}$ $|Z| > 2$

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech II year – I Semester Examinations, Model Paper-IV
SIGNALS AND SYSTEMS

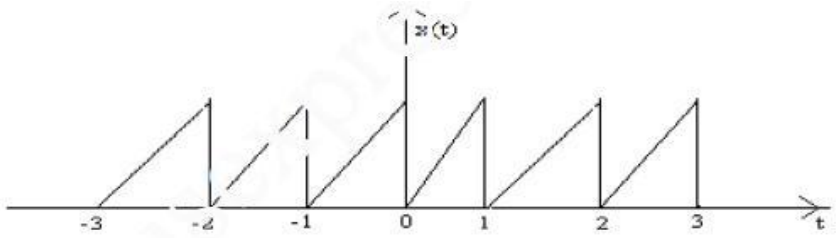
Time: 3 hours Max Marks: 70

Answer the following Questions

1. (a) How are signals classified? Differentiate between them. [10M]
   (b)Write short notes on Complex exponential signals and Sinusoidal signals [4M]

(OR)

2. Find the exponential Fourier series for the saw tooth waveform shown in figure. Plot the magnitude and phase spectrum. [14M]



SECTION – II

3. Find the Fourier transform of the following functions. [14M]
   i. Impulse function f(t).
   ii. DC Signal.
   iii. Unit step function
   iv Signum function

(OR)

4. (a) Explain the reconstruction of the signal from its samples [7M]
   (b) Explain Flat Top Sampling Method [7M]

SECTION – III

5. (a) What is an LTI system? Explain its properties. Derive an expression for the Transfer function of an LTI system. [7M]
   (b) Obtain the conditions for the distortion less transmission through a system. What do you understand by the term signal bandwidth? [7M]

(OR)

6. (a) Explain how input and output signals are related to impulse response of a LTI System. [7M]
   (b) Explain the ideal filter characteristics [7M]

SECTION – IV

7. (a) Derive Relation between Auto Correlation Function and Energy spectral density Function [7M]

   (b) Compare ESD and PSD [7M]

(OR)

8. (a) A signal $x(t)=e^{-2t}u(t)$ is passed through an idle LPF with cut off frequency of one radian /sec .

   (i) Test whether the input is an energy signal. [7M]

   (ii) Find the input and Output Energy [7M]

SECTION – V

9. (a) Derive relationship between Fourier Transform and Laplace Transform [7M]

   (b)Explain the properties of the region of convergence of X (z). [7M]

(OR)

10 (a) Consider the sequence Find X[Z]. [7M]

$$x[n] = \begin{cases} a^n & 0 \le n \le N-1, a > 0 \\ 0 & otherwise \end{cases}$$

(b) Find the Z-transform of $x(n) = \cos(n\omega)u(n)$. [7M]

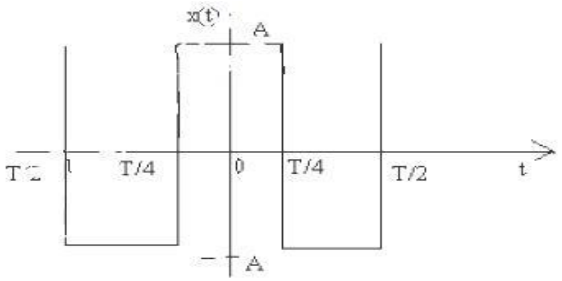
MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech II year – I Semester Examinations, Model Paper-V
SIGNALS AND SYSTEMS

Time: 3 hours Max Marks: 70

Answer the following Questions

SECTION – I

1. (a)State the Dirichlet's condition for Fourier series. [7M]
   (b)Find Trigonometric Fourier series for a periodic square waveform shown in figure which is symmetrical with respect to the vertical axis. [7M]



(OR)

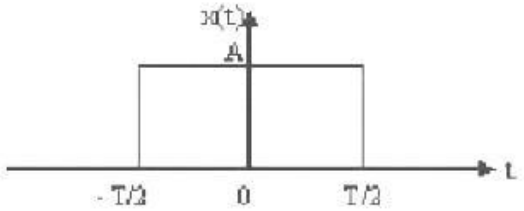
2. (a) Obtain the Fourier series representation of an impulse train given by [7M]

$$x(t) = \sum_{n=-\alpha}^{\alpha} \delta(t - n\tau_0).$$

   (b)Derive polar Fourier series from the exponential Fourier series representation and hence prove that Dn = 2 |Cn| [7M]

SECTION – II

3. (a) Prove the time scaling property of Fourier transform and hence find the Fourier Transform of f (t) = $e^{-0.5t}$. [7M]
   (b) Obtain the Fourier transform of Rectangular pulse of duration T and amplitude A as shown in figure [7M]



(OR)

4. (a) Explain the concepts of Impulse function and Sinc function. [7M]
   (b)Find the Fourier transform of the Rectangular Pulse and plot its amplitude and phase [7M]

SECTION – III

5. Explain the difference between a time invariant system and time variant system? What do you understand by the filter characteristics of a linear system. Explain the condition for causality of a LTI System? [14M]

(OR)

6. (a) What is an LTI system? Explain its properties. Derive an expression for the transfer function of an LTI system. [7M]

(b)Obtain the conditions for the distortion less transmission through a system. What do you understand by the term signal bandwidth? [7M]

SECTION – IV

7. State and Prove Properties of auto correlation and cross correlation functions? [10M]

(OR)

8. Prove that for a signal, auto correlation function and power spectral density forms a Fourier transform pair. [14M]

SECTION – V

9. (a) Find the Z-transform of [7M]

$$x[n] = \left(\frac{1}{2}\right)^n u[n] + \left(\frac{1}{3}\right)^n u[-n-1].$$

(b) Derive relationship between z and Laplace Transform [7M]

(OR)

10. (a) Explain the properties of the region of convergence of X (z). [7M]

(b) Discuss in detail about the double sided and single sided Z-transform. Correlate Laplace transform and Z transform in their end use [7M]

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech II year – I Semester Examinations, Model Paper-VI

SIGNALS AND SYSTEMS

Time: 3 hours Max Marks: 70

Answer the following Questions

SECTION – I

1. (a) Determine the trigonometric Fourier series of a full wave rectified Function. [14M]

(OR)

2. (a) Sketch the signal and find whether the signal are energy signal or power signal [8M]

(i) $e^{-5t}\ u(t)$ (ii) u(t)-u(t-4)

(iii) Sin wt u(t-1) u(9-t) (iv) u(t)+u(t-2)

(b) Find which of the signals are energy signals and Power signals? [6M]

(i) $(\frac{1}{2})^n\ u(n)$ (ii) $e^{j[(\frac{\pi}{8})n+(\frac{\pi}{2})n]}$

SECTION – II

3. (a) Find the Fourier transform of a gate pulse of unit height, unit width and centered at t=0 [7M]

(b) Find the Fourier Transform of f (t) = t Cos 2t. [7M]

(OR)

4. (a) Determine the Fourier transform of the sinusoidal pulse shown below: [7M]

(b) Determine the Fourier transform of f(t) = $e^{-a|t|}$ sgn (t) . [7M]

SECTION – III

5. (a) Explain flat top sampling. [7M]

(b)Determine the Nyquist sampling rate and Nyquist sampling interval for the signals. [7M]

(i) sinc(100πt)

(ii) sinc2(100πt)

(iii) sinc(100πt) + sinc(50πt)

(iv) sinc(100πt) + 3 sinc2(60πt)

(OR)

6. (a) With the help of graphical example explain sampling theorem for Band limited Signals. [7M]

(b)Explain briefly about Band pass sampling [7M]

SECTION – IV

7. (a) If V(t) = Sin $\omega_0 t$. find R(τ) and find energy spectral density GE (f) = Fourier transform of R (τ) [8M]

   (b)Use the convolution theorem to find the spectrum of x (t) = A Cos2 $\omega_c t$. [6M]

(OR)

8. (a) The signal V(t) = cos ω_0 t + 2sin 3 ω_0 t + 0.5 sin 4ω_0 t is filtered by an RC Low pass filter with a 3 dB frequency. fc =2f_0. Find the output power S_o [8M]

   (b)State Parsvel's theorem for energy and power signals. [6M]

SECTION – V

9. Explain the Frequency differentiation and Time convolution properties of Laplace [14M]

$$F(s) = \frac{17s^3 + 7s^2 + s + 6}{s^5 + 3s^4 + 5s^3 + 4s^2 + 2s}$$

(OR)

10. Explain the Step and Impulse responses of Series R-C circuit using Laplace Transforms. [14M]

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MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY, HYDERABAD

B.Tech II Year I Semester Examinations, Model Paper I -2018

Electronic Devices and Circuits

(Common to EEE, ECE, CSE, EIE, BME, IT, MCT, ETM, ECOMPE)

Time: 3 hours **Max. Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

SECTION-I

1. (a) Draw the V-I characteristics of a diode with zero cut-in voltage and equivalent resistance of 100Ω. Draw the load line if RL is also 100 Ω. [7]
   (b) Explain V-I characteristics of pn junction Diode. [7]

(OR)

2. Explain the constructional and principal operations of SCR and PHOTO diode. [14]

SECTION-II

3. Draw and explain the circuit diagram of full-wave rectifier with inductor filter. Derive the Ripple factor equation. [14]

(OR)

4. Derive expressions for ripple factor, regulation and rectification efficiency of a Center tapped Transformer Full wave rectifier. [14]

SECTION-III

5. (a) Explain different current components in a transistor. [7]
   (b) Explain how Transistor acts as an Amplifier [7]

(OR)

6. Draw the circuit diagram of Common Emitter amplifier using accurate h-parameter model. Derive expressions for A_V, A_I, R_I & R_O. [14]

SECTION-IV

7. What are the compensation techniques used for V_{BE} and I_{CO}? Explain with the help of suitable circuits [14]

(OR)

8. (a) Design a collector to base bias circuit using silicon transistor to achieve a stability factor of 20, with the following specifications: V_{CC}=16V,V_{BE}= 0.7V,V_{CEQ}= 8V,I_{CQ}= 4mA & β= 50 [7]
   (b) Derive condition for thermal stability? [7]

SECTION-V

9. (a) With the help of neat sketches and characteristic curves explain the construction & operation of a JFET and mark the regions of operation on the characteristics. [7]

   (b) Derive expression for transconductance in a field effect transistor. [7]

(OR)

10. (a) Explain the construction and principle of operation of Depletion type N-channel MOSFET [7]

    (b) Compare BJT and FET [7]

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MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY, HYDERABAD

B.Tech II Year I Semester Examinations, Model Paper II -2018

Electronic Devices and Circuits

(Common to EEE, ECE, CSE, EIE, BME, IT, MCT, ETM, ECOMPE)

Time: 3 hours **Max. Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

SECTION-I

1. (a) Explain the effect of temperature on V-I characteristics of a diode. [7]

(b) Distinguish between drift and diffusion current in a semiconductor. [7]

(OR)

2. Explain the working of Tunnel diode with help of energy band diagrams and Draw V-I Characteristics [14]

SECTION-II

3. (a) A Full wave single phase rectifier makes use of 2 diodes, the internal forward resistance of each is considered to be constant and equal to 30Ω. The load resistance is 1KΩ. The transformer secondary voltage is 200-0-200V (rms).Calculate V_{DC}, I_{DC}, Ripple factor [7]

(b) A Zener voltage regulator circuit is to maintain constant voltage at 60 V, over a current range from 5 to 50 mA. The input supply voltage is 200 V. Determine the value of resistance R to be connected in the circuit, for voltage regulation from load current I_L = 0 mA to I_L max, the maximum possible value of I_L. What is the value I_L max? [7]

(OR)

4. Derive expression for FWR Rectifier i) DC load current ii) DC output voltage iii) Peak Inverse Voltage of each diode IV) Efficiency v) Ripple factor [14]

SECTION-III

5. (a) Compare the three transistor amplifier configurations with related to A_I, A_V, R_i & R_O [7].

(b) For the emitter follower with R_S = 0.5K, R_L = 50K, h_{fe}= -50, h_{re}= 1K, h_{oe} = 25μA/V, h_{re} = 1. Calculate A_V, A_I, Z_i and Z_O [7]

(OR)

6).(a) Draw the circuit diagram of a transistor in CB configuration and explain the output characteristics with the help of different regions. [7]

(b) Calculate the collector current and emitter current for a transistor with $\alpha_{D.C.}$ = 0.99 and

I I_{CBO} = 50 μA when the base current is 20μA. [7]

SECTION-IV

7. Draw a Fixed bias circuit & explain its operation.Calculate the Stability factor S S'. [14]

(OR)

8. Define stability factors for a BJT with Self biasing method. Suggest how this method to effects on operating point of a BJT circuit [14]

SECTION-V

9. (a) Sketch the drain characteristics of MOSFET for different values of V_{GS} & mark different regions of operation. [7]

(b) Give the construction details of JFET and explain its operation. [7]

(OR)

10. (a) Write short notes on applications of FET as a voltage variable resistor. [7]

(b) Explain the principle of CS FET amplifier with the help of circuit diagram. Derive the expressions for A_V, input impedance and output impedance [7]

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MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY, HYDERABAD

B.Tech II Year I Semester Examinations, Model Paper III -2018

Electronic Devices and Circuits

(Common to EEE, ECE, CSE, EIE, BME, IT, MCT, ETM, ECOMPE)

Time: 3 hours **Max. Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

SECTION-I

1. Explain in detail, the reason for exponential rise in forward characteristic of a diode with suitable mathematical expression. [14]

(OR)

2) a) Explain the construction and working principal of photo diode. [7]

b) Draw the equivalent circuits of diode [7]

SECTION-II

3. Draw the circuit diagram of a Full wave bridge rectifier. Explain the operation of circuit with relevant waveforms [14]

(OR)

4 a) Compare the performance of Inductor filter and capacitor filter. [7]

b) Explain Full wave rectifier with neat diagram? [7]

SECTION-III

5. (a) Define the hybrid parameters for a basic transistor circuit and give CE hybrid model. Explain input and output characteristics of C.E Configuration [14]

(OR)

6. (a) Summarise the salient features of the characteristics of BJT operatives in CE, CB and CC configurations? [7]

(b) Calculate the collector current and emitter current for a transistor with $\alpha_{D.C.} = 0.99$ and $I_{CBO} = 20$ μA when the base current is 50μ A. [7]

SECTION-IV

7. Draw a Collector feedback bias circuit and explain its operation. Calculate the Stability factor S [14]

(OR)

8. (a) What is a load line? Explain its significance. [7]

(b) Find the Q-point of self-bias transistor circuit with the following specifications: V_{CC} = 22.5V, $R_L = 5.6k\Omega$, $R_C = 1k\Omega$, $R_I = 90k\Omega$, $R_2 = 10k\Omega$, $V_{BE} = 0.7V$ and $\beta = 55$. Assume $I_B >> I_{CO}$. [7]

SECTION-V

9(a)	Bring out comparison between JFET and MOSFET.	[7]
(b)	Draw the circuit's diagram of common drain amplifier and derive expression for voltage gain	[7]
	(OR)	
10. (a)	Compare Depletion MOSFET and enhancement MOSFET	[7]
(b)	Explain in detail about generalized FET amplifier	[7]

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MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY, HYDERABAD

B.Tech II Year I Semester Examinations, Model Paper IV -2018

Electronic Devices and Circuits

(Common to EEE, ECE, CSE, EIE, BME, IT, MCT, ETM, ECOMPE)

Time: 3 hours **Max. Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

SECTION-I

1. (a) Explain the V-I characteristics of Zener diode and distinguish between Avalanche and Zener Break downs. [7]

(b) In a Zener diode regulator, the supply voltage = 300V, V_z = 220V, I_z = 15mA and load current = 25mA. Calculate the value of resistor required to be connected in series with the Zener diode. [7]

(OR)

2. Draw the basic structure of Varactor diode and explain its operation and V-I Characteristics. [14]

SECTION-II

3. A 230 V, 60Hz voltage is applied to the primary of a 5:1 step down, center tapped transformer used in a full wave rectifier having a load of 900Ω .If the diode resistance and the secondary coil resistance together has a resistance of 100Ω, determine
i) Dc voltage across the load. ii) Dc current flowing through the load.
iii) Dc power delivered to the load. iv) PIV across each diode. [14]

(OR)

4. (a) Design ripple factor of LC filter for a Full wave rectifier [7]

(b) In a full-wave rectifier using an LC – filter L-10mH, C=100μF and R_L = 500Ω . Calculate I_{DC} , V_{DC} for an input Vi=300sin (100 t) [7]

SECTION-III

5. (a) Draw the circuit diagram of a transistor in CB configuration and explain the output characteristics with the help of different regions. [7]

(b) In a germanium transistor collector current is 51mA, when base current is 0.4mA. If h_{fe} = β_{dc} = 125, Calculate cut off current, I_{CEO}. [7]

(OR)

6. (a)Explain the input and output characteristics of a transistor in CC configuration [7]

(b) Calculate the values of I_E, α_{dc} and β_{dc} for a transistor with I_B=13μA, I_C=200mA,I_{CBO}=6μA. Also determine the new level of I_C which will result from reducing I_B to 100mA [7]

SECTION-IV

7. Draw a Self bias circuit and explain its operation. Calculate the Stability factor S,S^{I},S^{II} [14]

(OR)

8 (a) what is a load line? Explain its significance. [7]

(b) Find the Q-point of self-bias transistor circuit with the following specifications: V_{CC}= 22.5V, R_L=5.6kΩ,R_C=1kΩ,R_I=90kΩ,R_2=10kΩ,V_{BE}= 0.7V and β = 55 [7]

SECTION-V

9) The field effect transistor is called a voltage-sensitive electronic control device. Explain why is the case? [7]

b) Define the circuit parameters of the JFET. How are they related to each other? [7]

(OR)

10.(a) Explain the construction and principle of operation of Enhancement mode N-channel MOSFET. [7]

b) Compare BJT & FET. [7]

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MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY, HYDERABAD
B.Tech II Year I Semester Examinations, Model Paper V -2018

Electronic Devices and Circuits

(Common to EEE, ECE, CSE, EIE, BME, IT, MCT, ETM, ECOMPE)

PART-A

Time: 3 hours **Max. Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

SECTION-I

1. (a) Explain and Derive expression for transition capacitance? [7]

(b) Find the value of D.C. resistance and A.C resistance of a Germanium junction diode at 25^0 C with reverse saturation current, $I_o = 25\mu A$ and at an applied voltage of 0.2V across the diode. [7]

(OR)

2. With neat energy band diagrams, explain the V-I characteristics of Tunnel diode in detail. Also explain the negative-resistance region in the characteristics and applications of Tunnel diode. [14]

SECTION-II

3. Draw the circuit diagram of full-wave rectifier with inductor filter. Explain its operation with necessary equations. [14]

(OR)

4. Derive the expression for the ripple factor of π-Section filter when used with a Full-wave-rectifier. Make necessary approximations. [14]

SECTION-III

5.(a) Based on the currents flowing through a BJT illustrate the amplification process. [7]

(b) Compare CB, CC, and CE configurations [7]

(OR)

6. Draw the circuit diagram, AC equivalent & small signal equivalent of Common Emitter amplifier using accurate h-parameter model. Derive expressions for A_V, A_I, R_I & R_O. [14]

SECTION-IV

7. Explain the basic requirements of transistor biasing. Verify these requirements in collector to base bias circuit. [14]

(OR)

8. Design a fixed bias circuit using silicon transistor, with the following specifications: V_{CC} = 16V, V_{BE} = 0.7V, V_{CEQ} = 8V, I_{CQ} = 4 mA & β= 50. [14]

SECTION-V

9. (a) A self biased P-channel JFET has a pinch-off voltage of V_P=5V and I_{DSS}=12mA .the supply voltage is 12V .Determine the values of R_D and R_S so that I_D=5ma and V_{DS}=6V[7]

(b) List the advantages and disadvantages of FET over MOSFET [7]

(OR)

10. (a) Explain self biasing of Common source JFET [7]

(b) Explain the significance of threshold voltage of an E-MOSFET. [7]

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech II year – I Semester Examinations, Model Paper-1

Electronic Devices and Circuits

Time: 3 hours **Max. Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

SECTION-I

1. (a) At room temperature, the diode current is 0.8 mA when the applied voltage is 400 mV, and diode current is 20 mA when the applied voltage is 500 mV. Determine the value of η. [7M]
   (b) Explain the effect of temperature on the diode characteristics. [7M]

OR

2. Explain the tunnel diode with an energy band diagram. [7M]

SECTION-II

3 (a) A 230V 60Hz voltage is applied to the primary of a 5:1 step down center tapped transformer used in a full wave rectifier having a load of 900 Ω. If the diode resistance and the secondary coil resistance together has a resistance of 100 Ω, determine [7M]
   (i) DC voltage across the load
   (ii) DC current flowing through the load
   (iii) PIV across each diode
   (b) Explain the operation of full Wave Rectifier with Capacitor Filter [7M]

OR

4. A full wave rectifier is operated from 50 Hz supply with 120 V (r.m.s.). It is connected to a load drawing 50mA current and using 100μF filter capacitor. Calculate the DC output voltage and r.m.s. value of ripple voltage. Also calculate the ripple factor. [7M]
   (b) Draw the circuit diagram of half wave type rectifier and explain its operation. [7M].

SECTION-III

5. Explain the input and output characteristics of a transistor in CE configuration. [7M]

OR

6 (a) Explain what is meant by early effect? What are its consequences? [7M]
   (b) A CE transistor amplifier circuit has the source resistance of 100 Ω, load resistance R_L=10 K Ω, h_{ie}= 1K Ω, h_{fe}=50, h_{re}= $2.5x10^{-4}$, and h_{oe} = $25x10^{-6}$ A/V. calculate input resistance, output resistance voltage, current and power gain. [7M]

SECTION-IV

7. A silicon transistor is used in voltage divider bias arrangement with V_{CC}= 16 V, and R_C = 1.5 K Ω. The operating point is chosen to be V_{EC}= 8V, and I_C= 4mA. A stability factor S=12 is desired When β =50. Find R_1, R_2 and R_E. [7M]
   (b) What is Thermal runaway? How it can be avoided [7M]

OR

8. What is biasing? With neat circuit diagram, explain the self biasing method and derive the expression for its stability factor. [7M]

SECTION-V

9. (a) Explain the operation of n-channel JFET. Why the name field effect is used for the device? [7]
   (b) Define the pinch-off voltage. Mark pinch-off locus from drain characteristics. [7].

OR

10. (a)Explain the operation of a n-channel MOSFET in depletion mode. [7]
   (b) Explain the operation of a n-channel MOSFET in enhancement mode. [7]

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech II year – I Semester Examinations, Model Paper-1
Electronic Devices and Circuits

Time: 3 hours **Max. Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

SECTION-I

1. (a) The reverse saturation current of a silicon diode is 50 µA at room temperature. Find the forward diode current at 40^0C and a forward voltage of 0.3V [7]

(b) What is P-N junction diode? How potential barrier is formed in a P-N junction diode? [7]

OR

2.(a) Explain Avalanche and Zener breakdowns in PN junction diode. [7]

(b) Explain the working principle of Tunnel diode. [7]

SECTION-II

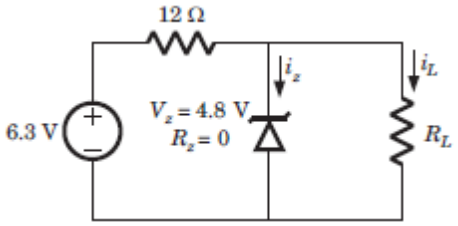
3. (a) Derive the ripple factor expression of a full wave rectifier with capacitor filter [7]

(b) A sinusoidal voltage of magnitude V_m = 24 V is applied to a half wave rectifier. The diode may be considered to be ideal and R_L = 1.8KΩ is connected as load. Find Peak value of current, RMS value of current, DC value of current and ripple factor. [7]

OR

4.(a)Explain the operation of Full wave rectifier with necessary graphs. [7]

(b) In the voltage regulator circuit shown below, the Zener diode current is to be limited to the range $5 \leq i_z \leq 100$ mA. Find the range of load current and load resistance. [7]



SECTION-III

5. (a)A transistor with α = 0.985 has a reverse saturation current of 2µA in C.B. configuration. Calculate the value of leakage current in the C.E. configuration. Also find out the collector current and emitter current if the base current is 25µA. [7]

(b). How the Transistor acts as an amplifier. [7]

OR

6. (a) For the emitter follower, with source resistance 100 Ω, load resistance R_L=5 K Ω, h_{ic}= 1K Ω, h_{fc}= -51, h_{rc}= 1, and h_{oc} = 25x10^{-6} A/V. calculate input resistance, output resistance voltage and current gain. [7]

(b) Draw and explain the output characteristics of BJT in common base configuration. [7]

SECTION-IV

7. (a) A Silicon transistor uses voltage divider bias method with β =100, V_{CC}= 12 V, R_C = 4K Ω, R_1= 10K Ω and R_2= 100K Ω and R_E = 3KΩ, V_{BE} = 0.6 V. Determine the operating point and stability factor. [7]

(b) What do you understand by DC and AC load lines? [7]

OR

8. (a) Draw the circuit diagram of a self bias circuit of CE amplifier and derive the expression for stability factor. [5]

(b) In a silicon transistor circuit with fixed bias V_{CC} = 9V, R_C = 3K Ω, R_B = 40K Ω, β =50, V_{BE} = 0.7V. Find the operating point and stability factor. [7]

SECTION-V

9. (a) Draw and Explain the operation of depletion type MOSFET. [7]

(b) Why FET is called voltage variable resistor (VVR). [7]

OR

10. (a) Define the three FET parameters: gm, rd and μ. Prove that μ=gm x rd. [7]

(b) Explain the transfer characteristics of n-channel JFET. [7]

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

Electrical Technology

(ECE)

Time: 3 hours **Max. Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one Question from each section and each question carries 14 marks..

SECTION – I

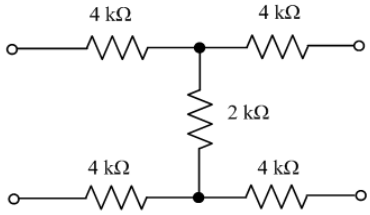
1. a) Explain DC response of RC series circuit. **(7M)**
   b) A series RLC circuit with R=6ohm, L=2H and C=0.25F is excited by a dc voltage of 2V. Obtain expression for I(t) . **(7M)**

OR

2. Explain Transient response of a series R-L-C circuit and draw a current, voltage and power response ? **(14M)**

SECTION – II

3.a) Determine Z parameters for network shown below **(7M)**



b) Explain h- parameters of two port network and obtain relationship with z parameters. **(7M)**

OR

4. a) Express Z parameters in terms of Y parameters and vice versa **(7M)**
   b) Determine the H parameters with the following data. **(7M)**
   i. with the output terminals short circuited V1=25V,I1=1A,I2=2A
   ii with the input terminals open circuited V1=10V,V2=50V,I2=2A

SECTION – III

5. a) Bring out drawbacks of constant K filter. **(7M)**

   b) Design a low pass filter (both T and π sections) having a cutoff frequency of 2 KHz to operate With a terminated load resistance of 500ohm. **(7M)**

OR

6 .Design a T-type and Π- Type attenuators **(14M)**

SECTION – IV

7.a) prove that locus of the current phasor for a series circuit consisting fixed capacitance in series with a variable resistance R is a semicircle if the circuit is connected to a sinusoidal ac supply of constant voltage. **(7M)**

b) Explain circle equations for RL circuit with fixed resistance and variable reactance. **(7M)**

OR

8. What is resonance? Explain relationship between bandwidth and quality factor in case of series R- L-C circuit. **(14M)**

SECTION – V

9. Explain construction and principle of operation of DC generator **(14M)**

OR

10. a) Give classification of DC motors with neat diagram and equations. **(7M)**
    b) A 250V, DC shunt motor takes a line current of 20A.resistance of shunt field winding is 200 Ω and resistance of armature is 0.3 Ω. Find armature current and back emf. **(7M)**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

Electrical Technology

(ECE)

Time: 3 hours **Max. Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one Question from each section and each question carries 14 marks..

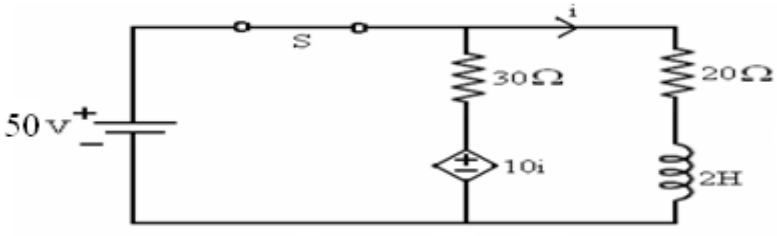
SECTION – I

1. a) Explain DC response of RL series circuit. **(7M)**

   b) A series RLC circuit with R=10ohm, L=4H and C=0.5F is excited by a dc voltage of 12V. Obtain expression for I(t) . **(7M)**

OR

2. For the below circuit (Fig. 1), find the current equation i(t), when the switch is opened at t = 0 **(14M)**

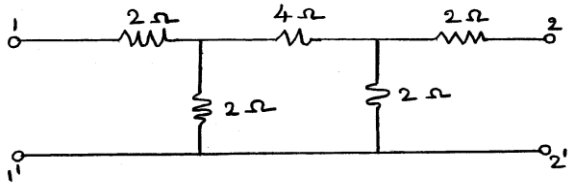


SECTION – II

3. Define Image impedances Z_{i1} and Z_{i2} of a two port network. From this definition derive expressions for the image impedances in terms of ABCD parameters. **(14M)**

OR

4. a) Find Transmission parameters for the following network. (7M)



b) Represent h- parameters in terms of Y-parameters for a two port net work (7M)

SECTION – III

5. Explain about constant – K high pass filter and derive the cut off frequency and characteristics impedance (14M)

OR

6. a) Design a Band-pass filter section to be terminated in 600Ω resistance and having cut-off frequencies of 2 kHz and 5 kHz (7M)

b) Design a symmetrical Lattice attenuator to have a characteristic impedance of 100Ω and attenuation of 12 dB (7M)

SECTION – IV

7. Explain about parallel Resonance in detail along with quality factor and band width (14M)

OR

8. Draw the locus diagram of series R-L circuit and R-C circuit when R is variable. (14M)

SECTION – V

9. a)Explain the working principle and operation of DC Motor. (7M)

   b) Derive Torque equation of a DC motor (7M)

OR

10.a) Derive EMF equation of a DC Generator (7M)

   b.)Explain magnetization characteristics of DC Shunt Generator (7M)

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

Electrical Technology

(ECE)

Time: 3 hours **Max. Marks: 70**

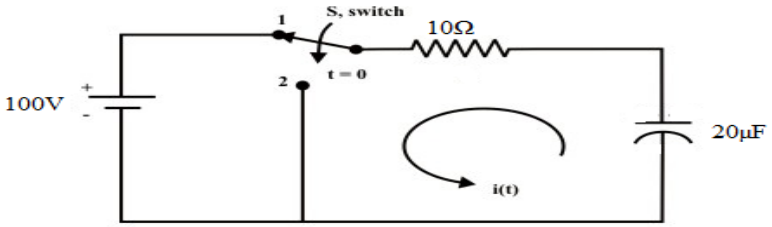
Note: This question paper contains of 5 sections. Answer five questions, choosing one Question from each section and each question carries 14 marks..

SECTION – I

1. Explain DC response of RLC series circuit and also draw voltage, current & power waveforms . **(14M)**

OR

2. In the given circuit the switch is shifted from position-1 to position -2 at t=0.Determine i(t) for t>0. **(14M)**



SECTION – II

3. Explain about the interconnection of two port networks in series parallel and cascaded configurations.. **(14M)**

OR

4. a) Represent Z- parameters in terms of ABCD-parameters for a two port net work. (7M)

b) Represent ABCD- parameters in terms of h-parameters for a two port net work (7M)

SECTION – III

5. Explain about constant – K Band pass filter and derive the cut off frequency and characteristics impedance (14M)

OR

6. a) Design a symmetrical Lattice attenuator (7M)

b) Design a T and π attenuator to have a characteristic impedance of 200Ω and attenuation of 18 dB (7M)

SECTION – IV

7. Explain about series Resonance in detail along with quality factor and band width (14M)

OR

8. Draw the admittance locus diagrams of series R-C circuit and R-L circuit when R is variable. (14M)

SECTION – V

9. a)Explain classification of DC Motor. (7M)

b) Explain different types of losses in DC machine (7M)

OR

10. Explain Swinburne's test on DC Shunt machine (14M)

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

Electrical Technology

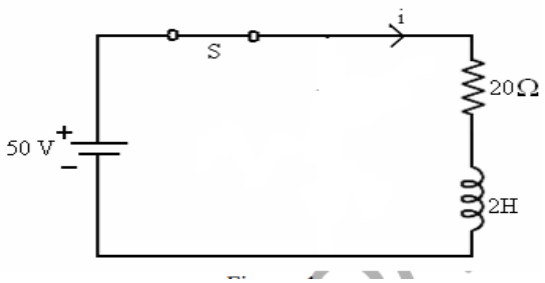
(ECE)

Time: 3 hours **Max. Marks: 70**

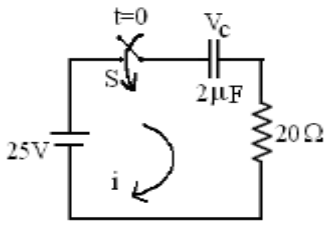
Note: This question paper contains of 5 sections. Answer five questions, choosing one Question from each section and each question carries 14 marks..

SECTION – I

1. a) Determine the expression for current i(t) when the switch is closed at time t=0 by using Laplace Transform Approach. **(7M)**

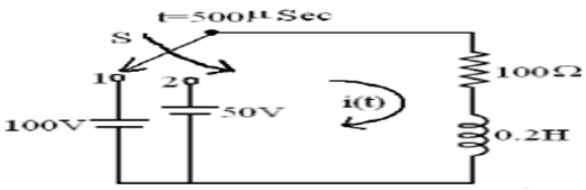


b) The switch S is closed at t = 0. Find the initial conditions at t = 0+ for i1, Vc, di1/dt. **(7M)**



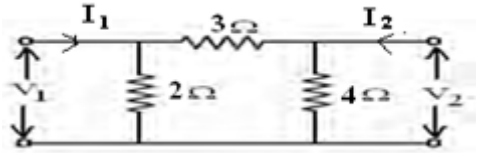
OR

2. In the circuit shown in Figure , the switch is closed on the position 1 at t = 0 there by applying a D.C. voltage of 100V to series R-L circuit. At t = 500μsec, the switch is moved to position 2. Obtain the expression for current i(t) in the both intervals sketch i(t). (14M)

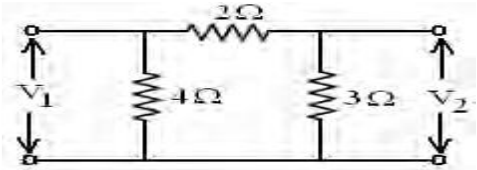


SECTION – II

3. a)Determine ABCD parameters for the given network. **(7M)**



b) Determine the h-parameters for the given circuit **(7M)**



OR

4. Find Z and Y parameter of the network shown below figure.(14M)

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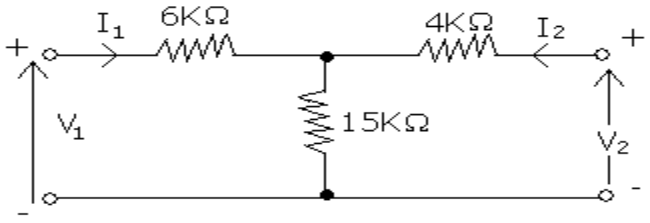


SECTION – III

5. Explain about constant – K Band stop filter and derive the cut off frequency and characteristics impedance (14M)

OR

6. a) Design a Bridged T-type attenuator (7M)

b) Design a symmetrical Bridged T-type attenuator to have a characteristic impedance of 150Ω and attenuation of 6 dB (7M)

SECTION – IV

7. Explain about parallel Resonance in detail along with quality factor and band width (14M)

OR

8. Draw the locus diagram of series R-L circuit and R-C circuit when reactance is variable. (14M)

SECTION – V

9. a)Explain the construction of DC machine (7M)

b) Mention applications of different types of DC Motors (7M)

OR

10.a) Explain classification of DC Generator (7M)

b.)Explain load characteristics of DC Series Generator (7M)

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

UG Model question paper

Managerial Economics and Financial Analysis

Time:3hours Max Marks: 70

Note: This question of 5 sections. Answer five questions, choosing one question from each section and each question paper contains carries 14 marks.

Section-I

1. a) what is managerial economics? Discuss the nature & Scope of Managerial economics [7M]

   b) What is demand forecasting? Explain various factors involved in demand forecasting. [7M]

OR

2. a) Explain Law of Demand with its exceptions [7M]

   b) Distinguish between Micro and Macroeconomic concepts (7M)

Section-II

3. a)Define Production function. How can a producer find it useful? Illustrate. (4M)

   b) Define Cost. Explain the different cost concepts used in the process of Cost Analysis. (7M)

   c) Explain about cob Douglas production function (3M)

OR

4. a) Discuss about the economies and diseconomies of scale. (7M)

   b) Calculate the BEP in units and rupees using the following details: • Selling price per unit Rs. 100 • Variable cost per unit Rs. 60 • Fixed costs Rs. 20,000 • Actual sales Rs. 2, 00,000 (7M)

Section-III

5. a) Define Market. Explain the structure of market with suitable examples. (7M)

   b) Define partnership. Explain its features and evaluate it as against sole proprietorship (7M)

OR

6. a) what is price? Explain different methods of Pricing. (7M)

   b) Explain the need for public enterprises in India. Do you think Public Enterprises as a whole have fulfilled that need? (7M)

Section-IV

7. a) What are the accounting concepts that govern accounting process? Explain in brief. (7M)

b) Explain the main sources have long term finance.

OR

8. a) Explain the factors affecting the requirements of working capital.

b) Explain about cash and capital budget.

Section-V

9. a) what is capital budgeting ? Explain methods of capital budgeting?

b) What is ratio analysis? Explain different types of ratio analysis

OR

10. a) Ram Enterprise is considering purchasing a CNC machine. The following are the earnings after tax from the two alternative proposal under consideration each costing Rs 8,00,000. Select the better proposal if the company wishes to operate @ 10% rate of return.

	Year 1	Year 2	Year 3	Year 4	Year 5
Proposal I	80,000	2,40,000	3,20,000	4,80,000	3,20,000
Proposal 2	2,40,000	3,20,000	4,00,000	2,40,000	1,60,000
Present value of Rs 1 @10%	0.909	0.826	0.751	0.683	0.620

b) What do you mean by capital budgeting? Explain its significance.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

UG Model question paper

Managerial Economics and Financial Analysis

Time:3hours Max Marks: 70

Note: This question of 5 sections. Answer five questions, choosing one question from each section and each question paper contains carries 14 marks.

Section-I

1. a) With the help of a diagram, show the Demand curve and explain why it slopes downwards. [7M]

   b) Explain the quantitative methods used in Demand forecasting.. [7M]

OR

2. a) Explain the basic economic tools in managerial economics. [7M]

   b) Explain the different types of elasticity of demand. (7M)

Section-II

3. a) Explain the concepts of cost and explain their contribution to managerial decisions. [7M]

   b) What is contribution? Explain its significance in cost-volume profit analysis. [7M]

OR

4. a) what is BEA? Explain its managerial significance. (7M)

   b) From the following particulars Find out Selling price Rs.200 per unit Variable cost Rs.100 per unit Total Fixed cost Rs.96,000 i)Break Even Units and Value. ii) Sales to earn a profit of Rs.20,000 [7M]

Section-III

5. a) Define Oligopoly markets? What are the features of an Oligopoly Markets With

   Suitable examples? (7M)

   b) Explain in detail the Sole proprietary form of business organization?

OR

6. a) List out the Different pricing methods? Explain any three pricing methods..

   b) Explain the need for public enterprises in India. Do you think Public Enterprises as a whole have fulfilled that need?

Section-IV

7. a) Distinguish between double entry and single entry system of Accounting.

b) write the formats for trading and profit& loss account.

OR

8. a) Explain the components of working capital. (7M)

b) Who are the users of financial statements and for what purpose do they use. (7M)

Section-V

9. a) Enumerate the features of capital budgeting? Explain the steps involved in capital budgeting process?

b) The following are the ratios related to XYZ Ltd. Inventory holding period 2 months Gross profit ratio 25% Gross profit for the current year amounted to Rs.2, 00,000. Closing stock is excess of RS 40,000 over opening stock. Find out: (a) Sales (b) Cost of goods sold. (c) Closing stock (d) Opening stock

OR

10. a) A company is considering an investment proposal to install new milling control at a cost of Rs. 55,000/-. The facility has a life expectancy of 5 years and no salvage value. The tax rate is 30%. Assume the firm uses single line depreciation and the same is allowed for tax purposes. The estimated cash flow before depreciation and tax (CFBT) from the investment proposal are as follows

Year	CFBT
1	13,600
2	16,590
3	14,769
4	13,660
5	24,855

Calculate Payback Period, ARR

b) What is meant by time value of money? What are the methods based on time value of money? (Explain with an illustration.).

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

UG Model question paper

Managerial Economics and Financial Analysis

Time:3hours Max Marks: 70

Note: This question of 5 sections. Answer five questions, choosing one question from each section and each question paper contains carries 14 marks.

Section-I

1. a) "Managerial Economics is the integration of economic theory with business practice for the purpose of facilitating decision making and forward planning by management". Explain?
   b) Define demand and describe its determinants with suitable examples?

OR

2. a) What do you understand by Elasticity of demand? How do you measure it? What is its significance? (7M)
   b) What do you understand by demand? What the different types are of demand? (7M)

Section-II

3. a) Explain and illustrate the following: and also mention why they arise: a) The Law of Constant Returns b) The Law of increasing returns. (7M)

   b) Discuss about iso quants and iso costs? (7M)

OR

4. a) Define BEP. How do you determine it. Show graphical presentation of BEA (7M)

   b) You are given the following information for the year 2003 of XYZ Co. Ltd: Variable Cost 6,00,000 60% Fixed Cost 3,00,000 30% Net Profit 1,00,000 10% 10,00,000 100% Find out i) Break Even Point in units and sales ii) PV Ratio iii) Margin of Safety iv) Number of units that must be sold to earn a profit of 5,00,000 v) How many units must be sold to earn a net income of 13.5% of sales (7M)

Section-III

5. a) Do you think monopoly is present in the current business environment? Explain it with suitable examples. (7M)

   b) Explain the merits and demerits of different forms of Business organization and their suitability with different types of business Activities (7M)

OR

6. a) what is pricing? Explain objectives and policies behind pricing. (7M)

   b) What is a public enterprise? State the features of public enterprises?? (7M)

Section-IV

7. a) Define accounting and write the importance, limitations & process of accounting. (7M)

b) what is working capital? Explain about working capital cycle. (7M)

OR

8. a) What is a Trial balance? List out the items that appear in a Trial balance?.

b) What is an account? How would you classify different accounts maintained by a business enterprise?(7M)

Section-V

9. a) What do you mean by capital budgeting? Explain its significance (7M)

b) What is ratio analysis? Explain different types of ratio analysis (7M)

OR

10. a)A company is considering an investment proposal to install new milling controls at a cost of Rs.50,000. The facility has a life expectancy of 5 years and no salvage value. The tax rate is 35 percent. Assume the firm uses straight line depreciation and the same is allowed for tax purposes. The estimated cash flows before depreciation and tax (CFBT) from the investment proposal are as follows:

Year	CFBT
1	10,000
2	10,692
3	12,769
4	13,462
5	20,385

Calculate the following: payback period, ARR and net present value at 10 percent discount rate. (7M)

b) How do you calculate Payback period and ARR. Explain with an example? (7M)

MIII QUESTION BANK

UNIT-I

Improper Integration

1. Define Beta function.
2. S.T. $\Gamma(\frac{1}{2}) = \sqrt{\pi}$
3. Define Gamma function.
4. Prove that $\beta(m,n) = \beta(m+1,n) + \beta(m,n+1)$.
5. Show that Beta function satisfying symmetry property.
6. Find $\int_0^2 x(8-x)^{1/3}\mathrm{dx}$.
7. Find $\int_0^{\pi/2} \sin^5\theta \cos^{7/2}\theta d\theta$
8. To show $\beta(m,n) = \int_0^\infty \frac{x^{n-1}}{(1+x)^{m+n}} dx$
9. S.T. $\int_0^1 \frac{x^2 dx}{\sqrt{1-x^4}} \times \int_0^1 \frac{dx}{\sqrt{1-x^4}} = \pi/4$
10. P.T. $\beta(m,n) = \frac{\lceil(m).\lceil(n)}{\lceil(m+n)}$ where $m>0, n>0$
11. P.T. $\beta(m,n) = 2\int_0^{\pi/2} \sin^{2m-1}\theta \cos^{2n-1}\theta d\theta$.
12. P.T. $2^{2n-1}\Gamma(n)\Gamma\left(n+\frac{1}{2}\right) = \Gamma(2n)\sqrt{\pi}$
13. S.T. $\int_0^\infty e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$
14. If m and n are +ve integers, then $\beta(m,n) = \frac{(m-1)!(n-1)!}{(m+n-1)!}$
15. S.T. $\lceil(n) = \int_0^1 \left(\log 1/x\right)^{n-1} dx, n>0$
16. S.T. $\beta(m,n) = \int_0^1 \frac{x^{m-1}+x^{n-1}}{(1+x)^{m+n}} dx$

UNIT – II

Special Functions

1. Prove That $\int_{-1}^{1} xP_n(x)P_{n-1}(x)dx = \frac{2n}{4n^2-1}$

2. Prove That $(1-x^2){P_n}^1(x) = (n+1)[xP_n(x) - P_{n+1}(x)]$.

3. Find the value of x^3 in terms of Legendre Polynomials.

4. If $f(x) = \begin{cases} 0, & if\ -1 < x < 0 \\ 1, & if\ 0 < x < 1 \end{cases}$

   a. Then Show That $f(x) = \frac{1}{2}P_0(x) + \frac{3}{4}P_1(x) - \frac{7}{16}P_3(x) + ---------$.

5. Prove That $(2n+1)xP_n(x) = (n+1)P_{n+1}(x) + nP_{n-1}(x)$.

6. State and Prove Generating Function for $J_n(x)$.

7. a. Write Rodrigue's Formula.

   a. b. Show that $P_0(x) = x$, $P_1(x) = x$, $P_2(x) = \frac{3x^2-1}{2}$ and hence express $2x^2 - 4x + 2$ as a Legendre Polynomial

8. Show that $P_n(x)$ is the coefficient of t^n in the expansion of $(1-2xt+t^2)^{-1/2}$

9. State and Prove Orthogonal property of Legendre Polynomial.

10. State and Prove Orthogonal property of Bessel polynomial.

11. Prove That $\frac{d}{dx}[x^{-n}J_n(x)] = -x^{-n}J_{n+1}(x)$.

12. S.T $\int_{-1}^{1} x^2P_{n+1}(x)P_{n-1}(x)dx = \frac{2n(n+1)}{(2n-1)(2n+1)(2n+3)}$.

13. Prove That ${xJ_n}^1(x) = -nJ_n(x) + xJ_{n-1}(x)$

14. Show That $P_n(1) = 1,\ P_n(-1) = (-1)^n$.

UNIT – III

Functions of a Complex Variable and Complex Integration

1. Define Analytic Function and Entire Function.
2. Evaluate $\oint \frac{z-1}{(z+1)^2(z-2)} dz \; where \; c: |z-i| = 2$ by Cauchy's Integral Formula
3. Evaluate $\int_C \frac{z+4}{z^2+2z+5} dz, \; where \; c: |z+1-i| = 2.$
4. a) If f(z) = u+iv is analytic in a domain D and uv is constant in D, then Prove That f(z) is Constant

   b) If w = $\Phi + i\psi$ represents the Complex Potential for an Electric Field and $\psi = x^2 - y^2 + \frac{x}{x^2+y^2}$, Determine Φ.
5. State and Prove Cauchy's Integral Formula
6. If f(z) = u + iv is an analytic function of z and $u - v = e^x(Cosy - Siny)$, find f(z) in terms of z.
7. Evaluate $\int_0^{1+i} (x^2 - iy)\, dz$ along (i). y = x, (ii). $y = x^2$
8. Find the value of k such that $f(z) = e^x(Cosky + i\, Sinky)$ is analytic
9. .Evaluate $\int_0^{1+i} [x^2 + 2xy + i(y^2 - x)] dz \; along \; y = x^2$
10. Find the analytic function whose real part is $e^{2x}(xCos2y - ySin2y)$.
11. If f(z) is an analytic function of z, Prove That $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^2 = 4|f^1(z)|^2$
12. Evaluate $\int_C \frac{logz}{(z-1)^3} dz, \; where \; c: |z-1| = \frac{1}{2}$ using Cauchy's Integral Formula.
13. Evaluate $\int_C \frac{z^2-z+1}{z-1} dz, \; where \; c: |z| = \frac{1}{2}.$
14. Show That the function is defined by $f(z) = \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}$ at $z \neq 0$, and f(0) = 0 is continuous and satisfies C-R equations at the origin but $f^1(0)$ does not exist.
15. Evaluate $\int_C \frac{z^4}{(z+1)(z-i)^2} \, dz$ where c is the Ellipse $9x^2 + 4y^2 = 36.$

UNIT-IV

Power series expansions of complex functions and contour Integration

1. State Maclaurin's Series.
2. Find the Residue of $\frac{ze^z}{(z-1)^3}$ at its Pole.
3. Find Taylor's Series of Sinz about$z = \frac{\pi}{4}$.
4. Define Removable, Essential and Pole Singularities.
5. Show That$(1+z)^{-1} = \sum_{n=0}^{\infty}(-1)^n z^{-n-1}, if\ |z| > 1.$
6. Define Residue at a Pole and Residue at Infinity.
7. State and Prove Taylor's Theorem of Complex Function f (z).
8. Evaluate $\int_C \frac{4-3z}{z(z-1)(z-2)}\,dz$ where c is $|z| = \frac{3}{2}$ using Residue Theorem.
9. Evaluate $\int_0^{\infty} \frac{dx}{1+x^2}$
10. State and Prove Laurent's Theorem.
11. Evaluate$\int_{-\infty}^{\infty} \frac{x^2-x+2}{x^4+10x^2+9}\,dx.$
12. Find the Laurent's Series of $\frac{1}{z^2-4z+3}$ for $1 < |z| < 3$.
13. Find the Taylor's Series of e^z about z = 3.
14. Find the Residue at z = 0 of the function$f(z) = \frac{1+e^z}{Sinz+zCosz}$.
15. Evaluate $\int_C \frac{z-3}{z^2+2z+5}dz$, where c is the Circle given by

(i).$|z| = 1$, (ii). $|z+1-i| = 2$, (iii). $|z+1+i| = 2$.

UNIT-V

CONFORMAL MAPPINGS

1. a) Write Standard Transformations.

   b) Show That the image of the Hyperbola $x^2 - y^2 = 1$ under the Transformation $w = \frac{1}{z}$ is the Lemniscates $\rho^2 = Cos\ 2\Phi$.

2. a) Find the Fixed Points of the Transformation (i). $w = \frac{2i-6z}{iz-3}$ (ii). $w = \frac{z-1}{z+1}$.

   b) Find the image of the infinite strip $0 < y < \frac{1}{2}$ under the mapping function $w = \frac{1}{z}$

3. a) Find the Bilinear Transformation which maps the points (2, i, -2) into the points (1, i, -1).

   b) Find the image of the Circle $|z - 1| = 1$ under the mapping $w = \frac{1}{z}$.

4. a) Define Critical Point and Bilinear Transformation.

   b) Show That Every Bilinear Transformation maps the Circles in the z-plane onto the Circles in the w-plane.

5. a) Find the Bilinear Transformation which maps the points z = -1, i, 1 into w = 0, i, ∞.

   b) Write Cross-Ratio of four points $z_1,\ z_2,\ z_3,\ z_4$.

6. a) Find the image of the line x = 4 in z-plane under the transformation w = z^2

   b) Find the Fixed Points of the Transformation.

   (i). $w = \frac{2i-6z}{iz-3}$ (ii). $w = \frac{6z-9}{z}$

7. Find the Fixed Points of the Transformation.

   $(i)\ w = \frac{z-1}{z+1}$ (ii). $w = \frac{2z-5}{z+4}$.

8. Find the Bilinear Transformation which maps the points (0, 1, i) into the points (1+i, -i, 2-i).

9. Under the transformation w = $\frac{1}{z}$, find the image of the circle $|z - 2i| = 2$.

10. Show that the function w = $\frac{4}{z}$ transforms the straight line x = c in the z – plane into a circle in the w-plane.

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech II year – I Semester Examinations, Model Paper-1

PROBABILITY THEORY AND STOCHASTIC PROCESSES

Time: 3 hours **Max. Marks: 70**

Answer one question from each section.

SECTION-I

1. a) State and Prove Bayes' theorem. 7M
   b) Explain the Mathematical model of experiment. 7M

(OR)

2. a) An experiment consists of observing the sum of the outcomes when two fair dice are thrown. Find the probability that the sum is 7 and find the probability that the sum is greater than 10. 7M
   b) In a factory there are 4 machines produce 10%,20%,30%,40% of an items respectively. The defective items produced by each machine are 5%,4%,3% and 2% respectively. Now an item is selected which is to be defective, what is the probability it being from the 2nd machine. And also write the statement of total probability theorem? 7M

SECTION-II

3. a) The exponential density function given by 7M
   $fx(x) = (1/b)e^{-(x-a)/b}$ $x > a$
   $= 0$ $x < a$ Find the mean and variance.
   b) Define Moment Generating Function and state and pove any 3 properties. 7M

OR

4. a) Explain the Binomial distribution & density function and also find its mean & variance. 10M
   b) Differentiate monotonic and non-monotonic transfomation of Random vaiable. 4M

SECTION-III

5. a) State and prove the density function of sum of two random variables. 7M
   b) The joint density function of two random variables X and Y is 7M

$$f_{XY}(x,y) = \begin{cases} \frac{(x+y)^2}{40} & ; -1 < x < 1 \text{ and } -3 < y < 3 \\ 0; \text{ otherwise} & \end{cases}$$

Find the variances of X and Y.

OR

6. a) Let Z=X+Y-C, where X and Y are independent random variables with variance σ^2_X, σ^2_Y and C is constant. Find the variance of Z in terms of σ^2_X, σ^2_Y and C. 7M

b) State and prove the properties of joint characteristic function. 7M

SECTION-IV

7. a) Define Stationary Process and explain various levels of Stationary Processes. 7M

b) A random process is given as X(t) = At, where A is a uniformly distributed random variable on (0,2). Find whether X(t) is wide sense stationary or not. 7M

OR

8. a) X(t) is a stationary random process with a mean of 3 and an auto correlation function of 6+5 exp (-0.2 $|\tau|$). Find the second central Moment of the random variable Y=Z-W, where 'Z' and 'W' are the samples of the random process at t=4 sec and t=8 sec respectively. 10M

b) Find Autocorrelation function of response of LTI system. 4M

SECTION-V

9. a) Check the following power spectral density functions are valid or not 7M

$i)\ \frac{cos8(\omega)}{2+\omega^4}\quad ii)\ e^{-(\omega-1)^2}$

b) Derive the relation between input PSD and output PSD of an LTI system 7M

OR

10. a)Derive the relationship between cross-power spectral density and cross correlation function. 10M

b) State the properties of PSD. 4M

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech II year – I Semester Examinations, Model Paper-2

PROBABILITY THEORY AND STOCHASTIC PROCESSES

Time: 3 hours **Max. Marks: 70**

Answer one question from each section.

SECTION-I

1. a) Differentiate joint and conditional probabilities. 4M

   b) In a box there are 100 resistors having resistance and tolerance values given in table. Let a resistor be selected from the box and assume that each resistor has the same likelihood of being chosen. Event A: Draw a 47Ω resistor, Event B: Draw a resistor with 5% tolerance, Event C: Draw a 100Ω resistor. Find the individual, joint and conditional probabilities. 10M

Resistance (Ω)	Tolerance		Total
	5%	10%	
22	10	14	24
47	28	16	44
100	24	8	32
Total	62	38	100

OR

2.a)Two boxes are selected randomly. The first box contains 2 white balls and 3 black balls. The second box contains 3 white and 4 black balls. What is the probability of drawing a white ball? 7M

b) An aircraft is used to fire at a target. It will be successful if 2 or more bombs hit the target. If the aircraft fires 3 bombs and the probability of the bomb hitting the target is 0.4, then what is the probability that the target is hit? 7M

SECTION-II

3. a)Derive the Poisson density function and find its mean & variance. 7M

   b) State and prove the properties of probability density function. 7M

OR

4. a)If X is a discrete random variable with a Moment generating function of $M_x(v)$, find the Moment generating function of 10M

   i) Y=aX+b ii)Y=KX iii) Y= $\frac{X+a}{b}$

   b) List the properties of conditional distribution and conditional density function. 4M

SECTION-III

5. a) State and explain the properties of joint density function 7M
   b) The joint density function of random variables X and Y is 7M

$$f_{XY}(x,y) = \begin{cases} 8xy; & 0 \le x < 1, 0 < y < 1 \\ 0, & otherwise \end{cases}$$

Find f(y/x) and f(x/y)

OR

6. a)The input to a binary communication system is a RV X, takes on one of two values 0 and 1, with probabilities ¾ and ¼ respectively. Due to the errors caused by the channel noise, the output random variable Y, differs from the Input X occasionally. The behavior of them communication system is modeled by the conditional probabilities

$P\left(\frac{Y=1}{X=1}\right) = \frac{3}{4}$ and $P\left(\frac{Y=0}{X=0}\right) = \frac{7}{8}$ Find

i) The probability for a transmitted message to be received as 0
ii) Probability that the transmitted message is a1. If the received is a 1. 10M
b) Explain covariance of two random variables. 4M

SECTION-IV

7. Explain the following (5+5+4)M
   i) Stationary
   ii) Ergodicity
   iii) Distribution & density functions of random processes

OR

8. a) Given the RP X(t) = A cos(w_0t) + B sin (w_0t) where ω_0 is a constant, and A and B are uncorrelated Zero mean random variables having different density functions but the same variance σ^2. Show that X(t) is wide sense stationary. (7+7)M

b) For a stationary Ergodic process X(t) with the periodic components the Auto correlation is $R_{XX}(\tau)= 36+4/(1+5\tau^2)$. Find E[X(t)], E[$X^2$(t)] and Power in the process X(t).

SECTION-V

9. A stationery random process X(t) has spectral density $S_{XX}(\omega)=25/(\omega^2+25)$ and an independent stationary process Y(t) has the spectral density $S_{YY}(\omega)= \omega^2/(\omega^2+25)$. If X(t) and Y(t) are of zero mean, find the: (7+7)M
   a) PSD of Z(t)=X(t) + Y(t)
   b) Cross spectral density of X(t) and Z(t)

OR

10. a)Find power spectral density of the random process whose autocorrelation function is $R_{XX}(\tau) = A\cos(\omega\tau)$ 7M
    b) The input to an LTI system with impulse response h(t)= $\delta(t) + t^2e^{-at}$. U(t) is a WSS process with mean of 3. Find the mean of the output of the system. 7M

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech II year – I Semester Examinations, Model Paper-3

PROBABILITY THEORY AND STOCHASTIC PROCESSES

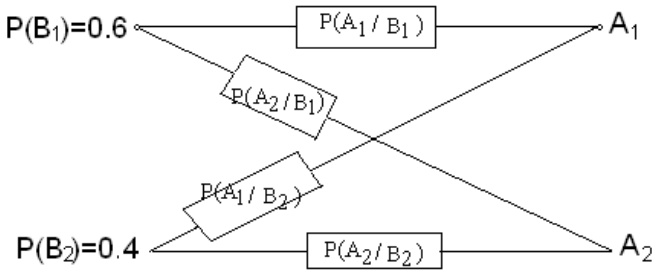
Time: 3 hours **Max. Marks: 70**

Answer one question from each section.

SECTION-I

1. a) Define Pobability Axioms with mathemetical expressions. 4M

   b) Determine probabilities of system error and correct system transmission of symbols for an elementary binary communication system shown in below figure consisting of a transmitter that sends one of two possible symbols (a 1 or a 0) over a channel to a receiver. The channel occasionally causes errors to occur so that a '1' show up at the receiver as a '0? And vice versa. Assume the symbols '1' and '0' are selected for a transmission as 0.6 and 0.4 respectively. 10M



OR

2. a) In a binary communication system, the errors occur with a probability of "p", In a block of "n" bits transmitted, what is the probability of receiving 7M

   i) at the most 1 bit in error

   ii at least 4 bits in error

   b)Define independent events and state the condition for independence of 2 and 3 events. 7M

SECTION-II

3. a) A random variable X has the distribution function 10M

   $F_X(x)= \sum_{n=1}^{12} \frac{n^2}{650} u(x-n)$

   Find the probability of i) $P\{-\infty < X \leq 6.5\}$ ii)$p\{X>4\}$ iii) $p\{6< X \leq 9\}$

   b)) State and prove the properties of probability distribution function 4M

OR

4. a) Let X be a Continuous random variable with density function 7M

f(x)= $\frac{x}{9} + K$ $0 \le x \le 6$

0 otherwise

Find the value of K and also find P{2 ≤ X ≤ 5}

b) Determine mean and vaiance of uniform distribution. 7M

SECTION-III

5. a) Let X and Y be the random variables defined as X=Cosθ and Y=Sinθ where θ is a uniform random variable over (0, 2π). Are X and Y Uncorrelated/Are X and Y Independent? 7M

b) Explain about Marginal Distribution and density Functions 7M

OR

6. a) Define and State the properties of joint cumulative distribution function of two random variables X and Y. 7M

b) A joint probability density function is $f_{x,y}(x,y) = \frac{1}{24}$ $0 < x < 6, 0 < y < 4$

0 else where

Find the expected value of the function $g(X,Y) = (XY)^2$ 7M

SECTION-IV

7. a) A Gaussian RP has an auto correlation function $R_{XX}(\tau) = \frac{6\sin(\pi\tau)}{\pi\tau}$. Determine a covariance matrix for the Random variable X (t) 7M

b) Derive the expression for cross correlation function between the input and output of a LTI system. 7M

OR

8. a) Derive the Expression for mean and mean square value of response of LTI system. 7M

b) Discuss in detail about stationary random process and its levels. 7M

SECTION-V

9. a) A random process Y(t) has the power spectral density $S_{YY}(\omega) = \frac{9}{\omega^2+64}$ 7M

Find i) the average power of the process

ii) The Auto correlation function

b) State and pove any3 properties of cross power spectral density 7M

OR

10. a) A random process has the power density spectrum $S_{YY}(\omega) = \frac{6\omega^2}{1+\omega^4}$. Find the average power in the process. 7M

b) Find the auto correlation function of the random process whose psd is $\frac{16}{\omega^2+4}$ 7M

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech II year – I Semester Examinations, Model Paper-4

PROBABILITY THEORY AND STOCHASTIC PROCESSES

Time: 3 hours **Max. Marks: 70**

Answer one question from each section.

SECTION-I

1. Let A and B are events in a sample space S. Show that if A and B are independent, then so are
   a) A and $\bar{B}$ b) $\bar{A}$ and B c) $\bar{A}$ and $\bar{B}$ (5+5+4)M

OR

2. a)Show that the conditionalprobability satiesfies the axioms of probability. 7M
   b)Define and explain following with example 7M
   i))Equall likely events

   ii) Exhaustive events

   iii) Mutually exclusive events

SECTION-II

3. a) Verify the Characteristic function of a random variable is having its maximum magnitude at ω=0 and find its maximum value. 7M
   b) Find the Moment generating function of exponential distribution? 7M

OR

4. a)The probability density function of a random variable X is given by f(x) =$\frac{x^2}{81}$ for -3<x<6 and e qual to zero otherwise. Find the density function of Y=$\frac{1}{3}$(12-x) 7M
   b) Explain about Binomial Distribution and density function with neat plots. 7M

SECTION-III

5. a)State and prove the central limit theorem 10M
   b) Let X be a random variable with mean E[X]=3 and Var(X)=2.Let another random variable Y is defined as Y= -6X+22 find m_{20},$m_{01}$and m_{11}. 4M

OR

6. a) Two random variables X and Y have zero mean and variance $\sigma_X^2 = 16$ and $\sigma_Y^2 = 36$ correlation coefficient is 0.5 determine the following 7M
   i) The variance of the sum of X and Y
   ii) The variance of the difference of X and Y
   b)State and prove the properties of joint characteristic function. 7M

SECTION-IV

7.a) A random process is given as X(t) = At, where A is a uniformly distributed random variable on (0,2). Find whether X(t) is wide sense stationary or not. 7M

b)State and prove the properties of auto correlation function. 7M

OR

8. Explain the following (5+5+4) M
   a) Stationarity
   b) Ergodicity
   c) Statistical independence with respect to random processes

SECTION-V

9. a)Find the cross correlation function corresponding to the cross power spectrum 7M

   $S_{XY}(\omega)=\frac{6}{(9+\omega^2)(3+j\omega)^2}$

   b) Write short notes on cross power density spectrum. 7M

OR

10. a) Consider a random process X(t)=cos($\omega t+\theta$)where ω is a real constant and $\theta$is a uniform random variable in (0, π/2). Find the average power in the process. 7M

    b) State and prove the relation between auto corelation and power spectrum. 7M

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech II year – I Semester Examinations, Model Paper-5

PROBABILITY THEORY AND STOCHASTIC PROCESSES

Time: 3 hours **Max. Marks: 70**

Answer one question from each section.

SECTION-I

1. a) An experiment consist of rolling a single die. Two events are defined as A = { 6 shows up}: and B= {2 or 5 shows up} 7M
   i) Find P(A) and P(B)
   ii) Define a third event C so that P(C) = 1-P(A)-P(B)
   b) Define probability as relative frequency and explainits properties. 7M

OR

2. a) State and prove the total probability theorem? 7M
   b) Explain about conditional probability. 7M

SECTION-II

3. a) Write short notes on Gaussian distribution and also find its mean? 7M
   b) Consider that a fair coin is tossed 3 times, Let X be a random variable, defined as X= number of tails appeared, find the expected value of X. 7M

OR

4. a) Find the characteristic function and first moment for 7M

$$f_X(x)=(1/b)\exp(-(x-a)/b) \quad x\geq a$$
$$=0 \quad \text{else}$$

   b) Find the probability of getting a total of 5 or 11, when tossing a pair of fair dice. 7M

SECTION-III

5. A certain binary system transmits two binary states X = +1 and X = -1 with equal probability. There are three possible states with the receiver, such as Y = +1, 0 and -1. The performance of the communication system is given as (5+5+4)M
   P(y = +1/X = +1) =0.2;
   P(Y= +1/X= -1) = 0.1; P(Y = 0/X = +1) = P(Y = 0/X = -1) = 0.05. Find
   a) P(Y = 0) b) P(X = +1/Y = +1)
   c) P(X = -1/Y = 0).

OR

6. Two random variables X and Y have the joint pdf is 14M

$$f_{x,y}(x,y)=\begin{cases} Ae^{-(2x+y)} & x,y\geq 0 \\ 0 & \text{elsewhere} \end{cases}$$

   i. Evaluate A

ii. Find the marginal pdf's
iii. Find the marginal pdf's
iv. Find the joint cdf
v. Find the distribution functions and conditional cdf's.

SECTION-IV

7. Explain about the following random process (5+5+4)M
   (i) Mean ergodic process
   (ii) Correlation ergodic process
   (iii) Gaussian random process

OR

8. a)State and prove the cross correlation function properties. 7M
   b) If X(t) is a WSS random process with auto correlation function $R_{XX}(\tau)=Ae^{-\alpha|\tau|}$ determine the mean , mean square value and second order moment of the random variable { X(8)-X(5) }. 7M

SECTION-V

9. a) The power spectrum density function of a stationary random process is given by 7M

$$S_{XX}(\omega)=\begin{cases} A, & -K<\omega<K \\ 0, & \text{other wise} \end{cases}$$

   Find the auto correlation function.
   b) Derive the expression for power spectrum density of response of LTI system. 7M

OR

10. a) Derive the expression cross power between input and output random process X(t) and Y(t) of LTI system. 7M
    b) Find the cross power spectral density for $R_{XY}(\tau)=\frac{A^2}{2}\sin(\omega_0\tau)$. 7M

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

R15

(Autonomous Institution – UGC, Govt. of India)

II B. Tech I Semester Supplementary Examinations, May 2018

Probability Theory and Stochastic Process

(ECE)

Roll No										

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B
Part A is compulsory which carriers 25 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

****

PART – A (25 Marks)

1. (a) Given that P(A) = 0.9, P(B) = 0.8, and P(A∩B) =0.75, find i) P(AUB); ii) P(A∩B') (2M)
   (b) State and explain Bayes' theorem. (3M)
   (c) Define random variable and list various types of random variables. (2M)
   (d) Define Probability density function. List its properties. (3M)
   (e) State and explain the significance of central limit theorem . (2M)
   (f) Distinguish between joint distribution and marginal distribution. (3M)
   (g) Explain the classification of random processes with neat sketches. (2M)
   (h) Explain Mean Ergodic random process. (3M)
   (i) State Relationship between Cross-Power Spectrum and Cross-Correlation Function (2M)
   (j) Expalin Power spectrial density. (3M)

PART – B (50 Marks)

SECTION – I

2. (a) If A and B are any events, not necessarily mutually exclusive events, derive an expression for probability of A Union B. When A and B are mutually exclusive, that happens to the above expression derived. [5M]
   (b) Define the term Independent events .State the conditions for independence of : [5M]
   i. any two events A and B
   ii. any three events A, B and C

(OR)

3. (a) Differentiate joint and conditional probability . [5M]
   (b) State and prove total probability theorem. [5M]

SECTION – II

4. (a) Define Probability distribution function and state its properties. [5M]
   (b) Consider the probability density $f(x) = ae^{-b|x|}$ where x is a random variable Whose allowable values range from $x = -\infty$ to ∞. [5M]
   Find:
   i. the CDF $F(x)$
   ii. The relationship between a and b and
   iii. The probability that the outcome X lies between 1 and 2.

(OR)

5. (a) Derive an expression for the average value and variance associated with the Binomial probability density function. [5M]
   (b) The average life of a certain type of electric bulb is Rs.1200 hours. What percentage of this type of bulbs is expected to fail in the first 800 hours of working? What percentage is expected to fail between 800 is 1000 hours? Assume a normal distribution with $\sigma = 200 hours$. [5M]

SECTION – III

6. a) State and prove any four properties of joint density function. [5M]
   (b) Find the density function of the distribution for which the characteristic function is $\emptyset(t) = e^{-(t^2\ \sigma^2)/2}$.[5M]

(OR)

7. (a) Explain statistical independence of two random variables. [5M]
   (b)Explain joint moments of two random variables. [5M]

SECTION – IV

8. Explain stationarity of the random process in detail. [10M]

(OR)

9. A random process $Y(t) = X(t) - X(t+\tau)$ is defined in terms of a process X(t) that is at least wide sense stationary. [10M]
   (i) Show that $\sigma_{Y2} = 2[R_{XX}(0) - R_{XX}(\tau)]$
   (ii) If $Y(t) = X(t) + X(t+\tau)$ find E[Y(t)] and σ_{Y2}

SECTION – V

10. State and prove the relation between power spectrum density and auto correlation function.[10

(OR)

11. a)Derive the relation between PSDs of input and output random process of an LTI system. [5M]
    (b) state and prove any three properties of power spectrum density[5M]

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Code No: R15A0403

R15

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, November 2017

Probability Theory and Stochastic Process

(ECE)

Roll No	1	6	N	3	1	A	0	4	1	6

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B
Part A is compulsory which carriers 25 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART – A (25 Marks)

1. (a) What is a random variable? Discuss various properties of a random variable — 2 MARKS
   (b) Define the following — 3 MARKS
   (i) Event (ii) Sample space (iii) Conditional Probability
   (c) If the Random variable X has uniform density, find its mean and variance — 2 MARKS
   (d) Define and explain the Gaussian random variable in brief? — 3 MARKS
   (e) State and prove any four properties of characteristic function? — 2 MARKS
   (f) Define moment generating function — 3 MARKS
   (g) State the condition for wide sense stationary Random process — 2 MARKS
   (h) Explain Variance Ergodic random process — 3 MARKS
   (i) Explain the Relationship between Power Spectrum and Autocorrelation Function — 2 MARKS
   (j) State any two properties of Power density spectrum — 3 MARKS

PART – B (50 Marks)

SECTION – I

2. a) Given that two events A and B are statistically independent, Show that A and $\bar{B}$, B and $\bar{A}$ are also independent [5]
   b) Determine the probability o f the card being either red or a king when one card is drawn from a regular deck of 52 cards. [5]

(OR)

3. A missile can be accidently launched if two relays A and B both have failed. The probabilities of A and B failing are known to be 0.01 and 0.03, respectively. It is also known that B is more likely to fail (probability 0.06) if A has failed. [5+5]
   a) What is the probability of an accidental missile launch?
   b) What is the probability that A will fail if B has failed?

SECTION – II

4. a) The Probability density function of X is given by the following table: [5]

X	0	1	2	3	4	5	6
P(x)	K	3K	5K	7K	9K	11K	13K

Find (i) $P(X < 4)$ (ii) $P(X \geq 5)$ (iii) $P(3 < X \leq 6)$
b) Define Rayleigh density and distribution function and explain them with their plots. [5]

(OR)

5. a) Find the value of the constant $b > 0$ in the given valid probability density function $f(x) = \frac{1}{4}(e^{\frac{-x}{4}})$ $0 \le x \le b$, other wise 0 [5]

b) Let X be a random variable defined by the density function [5]
$f_X(x) = 54(1 - x^4)$ $0 < x \le 1$
$= 0$ elsewhere
Find $E[X]$, $E[X^2]$ and variance.

SECTION – III

6. (a) Define conditional distribution and density function of two random variables X and Y [5]
(b) The joint probability density function of two random variables X and Y is [5]
given by $f(x, y) = a(2x + y^2)$ $0 \le x \le 2$, $2 \le y \le 4$
Find i.) value of 'a' ii.) $P(X \le 2, Y > 4)$.

(OR)

7. (a) Define Joint characteristic function and write it properties

(b)Write down the properties of Joint density function [5]

SECTION – IV

8. (a) A Stationary random process X(t) having an Auto Correlation function [5]
$R_{XX}(\tau) = 2^{e^{-4|\tau|}}$ find $S_{XX}(\omega)$

(b) State and Explain Covariance functions and its properties. [5]

(OR)

9. A random process is defined by $x(t) = A$, Where A is a continuous RV uniformly distributed on (0,1).
a) Find whether it is first order stationary or not
b) Determine whether it is wide sense stationary or not [5+5]

SECTION – V

10. (a) Derive an expression relating Auto correlation and Power Spectral density [5]
(b) Show the Relationship between Power Spectrum and Autocorrelation Function [5]

(OR)

11. (a) Find the ACF of the following PSD's [5]
i. $S_{XX}(\omega) = 1/(25 + \omega^2)$
ii. $S_{XX}(\omega) = 8/(9+\omega^2)^2$
b) Define power Spectral density and discuss its properties [5]

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Code No: R15A0403

R15

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester supplementary Examinations, May 2017

Probability Theory and Stochastic Process

(ECE)

Roll No										

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B

Part A is compulsory which carriers 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART - A **(25 Marks)**

1. (a) What is sample space? Explain the Discrete sample space and Continuous sample space each with a suitable example. [3M]
   (b) What is the probability of getting 53 Sundays in a leap year? [2M]
   (c) Explain Gaussian random Variable. [3M]
   (d) Define the moment generating function(MGF). [3M]
   (e) What is Central Limit theorem? [2M]
   (f) What is correlation co efficient and write its significance. [3M]
   (g) What is meant by Correlation ergodic process? [3M]
   (h) What is strict sense stationary process? [2M]
   (i) Write the properties of power density spectrum. [2M]
   (j) .Find the mean value of Random variable Y= -3X+22 where the mean of X is 3. [3M]

PART - B **(50 Marks)**

SECTION - I

2.a)Define i)ConditionalProbability(ii)Independentevents(iii)MutuallyExclusiveEvents (iv)Joint Probability

b)When two dice are thrown find the probability of getting (i){sum>7}(ii){2<sum<=5}iii){sum>10}

OR

3. a) A batch of 50 items contains 10 defective items. Suppose 10 items are selected at random and tested. What is the probability that exactly 5 of the items tested are defective?

b) State and prove Baye's theorem.

SECTION – II

4. a) Define probability density function and write its properties

b) If random variable X is transformed to the new random variable $Y= CX^2$, find the density function of Y.

OR

5. a) What is Probability distribution function? Explain its properties.

b)A random variable has probability density function

$f_x(x) = c\,x(1-x) \quad 0 \le x \le 1$

$0 \quad$ else where

Find i) c ii. $p(1/2 \le X \le 3/4)$ iii) $F_x(x)$

SECTION – III

6. a) Explain about joint moments & how they are generated.

b) Mean values of random variables X ,Y are 0.5, 2. Mean square values are 1.5, 5.5 and covariance of X and Y is -0.25. Find cross correlation and correlation coefficient.

OR

7. a) Find the conditional density functions for the joint distribution

$Fx,y(x,y)=4xyexp(x^2+y^2)u(x)u(y)$

b) Let X and Y be the random variables defined as $X=\cos\theta$ and $Y=\sin\theta$, where Φ is a uniform random variable over $(0,2\pi)$. Are X and Y uncorrelated? Are X and Y independent?

SECTION – IV

8. a) Write and prove properties of cross correlation function

b) Find the mean and Auto correlation function of the Random process $X(t) = A\cos(wt+\theta)$ where A and w are constants, θ is random variable uniformly distributed on the interval $(0,2\Pi)$

OR

9. a) a) State and prove Wiener Khinchin theorem.

b) X (t) is a WSS process and Y (t) = A cos $(\omega_c t + \theta)$ is a random process which is independent of X(t). Here, θ is a uniform random variable over $(-\pi, \pi)$. If the auto-correlation function of X (t) is $R_{XX}(\tau)$, Find the auto correlation of $Z(t)=X(t)Y(t)$.

SECTION – V

10.a) Derive the relationship between cross correlation function and cross power density spectrum. b) Find the power spectral density (P.S.D) of $X(t)=\cos(wt+\theta)$ where θ is a uniform random variable over $(0,\pi/2)$ and also find the average power.

OR

11. a) Find the relation between input and output power spectral density in a LTI System.

b) Check whether the following functions are valid power spectral density (PSD)

i) $\frac{cos8\omega^4}{2+\omega^4}$ ii) $e^{-(\omega-1)^2}$

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Code No: R15A0403-161

R15

G. S. Naveen

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

B.Tech. III Semester Regular Examinations, NOV 2016

PROBABILITY THEORY AND STOCHASTIC PROCESS

(ECE)

Roll No	1	5	N	3						

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B

Part A is compulsory which carriers 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART - A **(25 Marks)**

1. (a) When do you say that two events are independent? [2M]

(b) A card is drawn from a pack of 52 cards. Find the probability of getting a king or a heart or a red card. [3M]

(c) Discuss the conditions for a function to be a random variable. [2M]

(d) A discrete random variable X has possible values which occur with probabilities 0.4, 0.25, 0.15, 0.1 and 0.1 respectively. Find the mean value X. [3M]

(e) Explain the physical significance of variance of a random variable. [2M]

(f) Define joint central moments for the random variables X and Y. [2M]

(g) What is meant by Mean Ergodic process? [3M]

(h) Explain the classification of random processes [3M]

(i) Is power density spectrum an even function of 'ω'or odd function of 'ω'? Justify. [2M]

(j) Find the mean value of exponential random variable. [3M]

PART - B **(50 Marks)**

SECTION - I

2.a) Four cards are drawn from a well shuffled pack of playing cards. Find the probability that i) All are clubs ii) Two are spades & two are hearts iii) Four cards are from different suits.

b) Show that Conditional probability satisfies the three axioms of probability

OR

3. a) Telephone calls are initiated through an exchange at the average rate of 75 per minute and are described by a Poisson process. Find the probability that more than 3 calls are initiated in any 5 second period.

b) Explain the terms Joint probability and Conditional probability.

SECTION – II

4. a) Determine E[X] and VAR[X] of Poisson random variable X.

b) List the properties of conditional density function & conditional distribution function.

OR

5. a) A random variable has probability density function

$f_X(x) = cx(1-x) \quad 0 \le x \le 1$

$0 \quad$ else where

Find a) c b) $P(1/2 \le X \le 3/4)$ c) $Fx(x)$

b) Determine the cumulative distribution function and probability density function of Y given that $Y = 2X+3$ and that $f_X(x) = 2e^{-X} u(x)$.

SECTION – III

6. a Define joint central moments for two random variables X and Y and explain the covariance of two random variables.

b) The joint probability density function of two random variables X and Y is given by

$f(x,y) = c(2x+y)$; $0 \le x \le 1, 0 \le y \le 2$ 0; else where

Find: i) The value of 'c'. ii) Marginal distribution function of x and y.

OR

7. a) Derive the expressions for the distribution and density functions of sum of two statistically independent random variables.

b) The density function of two random variables X and Y is

$fxy(x, y) = u(x)\, u(y)\, 4e^{-2(x+y)}$. Find the mean value of the function $e^{-(x+y)}$.

SECTION – IV

8. a) Write and prove the properties of Auto correlation function

b) Find the mean and Auto correlation function of the Random process $X(t) = A\cos(wt+\theta)$ where A and w are constants, θ is random variable uniformly distributed on the interval $(0,2\Pi)$.

OR

9. a) X (t) is a WSS process and Y (t) = A cos ($\omega ct + \theta$) is a random process which is independent of X(t). Here, θ is a uniform random variable over $(-\pi, \pi)$. If the auto-correlation function of X (t) is $R_{XX}(\tau)$, Find the auto correlation of $Z(t)=X(t)Y(t)$.

b) For a stationary Ergodic process X(t) with the periodic components the Auto correlation is $R_{XX}(\tau)= 36+4/(1+5\tau^2)$. Find $E[X(t)]$, $E[X^2(t)]$ and Power in the process X(t).

SECTION – V

10. a)Derive an expression for Auto correlation function of response of a linear system with random input.

b) Write about power density spectrum of Response of Linear system

OR

11. a Find the power density spectrum of a random process whose autocorrelation Function is $R_{XX}(\tau) = A \cos(\omega\tau)$.

b) State and prove properties of power spectral density of random process.

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