

**Model Question Paper-1**  
**Probability and Statistics**

Answer All the following

[70 marks]

1a) A random variable has the following probability function

x	0	1	2	3	4	5	6	7
P(x)	0	K	2K	2K	3K	K <sup>2</sup>	2K <sup>2</sup>	7K <sup>2</sup> +K

Determine i) k ii) mean iii) variance

b) Suppose the weights of 800 male students are normally distributed with 28.8kg and SD of 2.06 kg. Find the number of students whose weights are

i) between 28.4 kg and 30.4kg ii) more than 31.3 kg

OR

2) For the following  $\theta$  bivariate (two dimensional) probability distribution of X and Y find

i)  $P(X \leq 2, Y=2)$  ii)  $F_X(2)$  iii)  $P(Y=3)$  iv)  $P(X < 3, Y \leq 4)$  v)  $F_Y(3)$

X/Y	1	2	3	4
1	0.1	0	0.2	0.1
2	0.05	0.12	0.08	0.01
3	0.1	0.05	0.1	0.09

3a). Find the karlpearson's coefficient of correlation for the paired data:

wages	100	101	102	100	99	97	98	96	95	102
Cost of living	98	99	99	95	92	95	94	90	91	97

b) If  $\theta$  is the angle between two regression lines and S.D of Y is twice the S.D of X and  $r=1.25$ , find  $\tan\theta$ .

OR

4. The heights of mothers and daughters are given in the following table. From the two tables of regression estimate average height of daughter when the height of the mother is 64.5 inches

Height of mother	62	63	64	64	65	66	68	70
Height of daughter	64	65	61	69	67	68	71	65

5. a) A sample of size 64 and mean 70 was taken from a population whose standard deviation is 10. Construct 95% confidence interval for the mean.

b) A coin is tossed 960 times. Head turned up 184 times. Find whether the coin is unbiased.

OR

6. a) A lady stenographer claims that she can take the dictation at the rate of 120 words per minute. Can we reject the claim on the basis of 100 trials in which she demonstrates a mean of 116 words with a SD of 15 words.

b) Explain the procedure for Testing of Hypothesis

7. A survey of 320 families with 4 children each revealed the following distribution

No# of boys	5	4	3	2	1	0
No# of girls	0	1	2	3	4	5
No# of families	14	56	110	88	40	12

Is this result consistent with the hypothesis that male and female births are equally popular?

OR

8. The following are the average weekly losses of worker hours due to accidents in 10 industrial plant before and after a certain safety programme was put into operation:

Before	45	73	46	124	33	57	83	34	26	17
After	36	60	44	119	35	51	77	29	24	11

Test whether the safety programme is effective in reducing the number of accidents at 5%LOS

9. Patients arrive at a clinic according to a Poisson distribution at the rate of 30 patients per hour. The waiting room does not accommodate more than 13 patients not including the one i.e, examine. Examination time per patient is exponential with mean rate 20 per hour.
- Find the effective arrival rate at the clinic
  - What is the probability that an arriving patient will not wait
  - What is the expected waiting until the patient is discharged from the clinic.

OR

- 10a) Discuss Markov Process.

b) The transition probability matrix is given by  $P = \begin{bmatrix} 0.1 & 0.4 & 0.5 \\ 0.2 & 0.2 & 0.6 \\ 0.7 & 0.2 & 0.1 \end{bmatrix}$  and  $p_0 = [0.4 \quad 0.4 \quad 0.2]$

- Find the distribution after three transitions
- Find the limiting probabilities

## Model Question Paper-2 Probability and Statistics

Answer All the questions

[70 marks]

1 a) If the p.d.f of a r.v  $x$  is given by  $f(x) = \begin{cases} k(1 - x^2), & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$

find i)  $k$  and ii) the cumulative distribution function of  $x$

b) The average number of phone calls /minute coming into a switch board between 2pm and 4pm is 2.5. Determine the probability the probability that one particular minute there will be

i) 4 or fewer ii) more than 6 calls

OR

2. A sales tax officer has reported that the average sales of the 500 businesses that he has to deal with during a year is Rs.36,000 with a standard deviation of Rs.10,000. Assuming that the sales in these businesses are normally distributed, find :

i) The number of business as the sales of which are greater than Rs.40,000

ii) The percentage of business the sales of which are likely to range between Rs.30,000 and Rs.40,000

3 a) Fit a straight line  $Y = a_0 + a_1X$  for the following data and estimate the value of  $Y$  when  $X = 25$

X	0	5	10	15	20
Y	7	11	16	20	26

b) Show that the maximum value of rank correlation coefficient is 1

OR

4a) The marks obtained by 10 students in mathematics and statistics are given below. Find the rank correlation coefficient between the two subjects

Marks in mathematics	25	28	30	32	35	36	38	42	45	39
Marks in Statistics	20	26	29	30	25	18	26	35	46	35

b) Find the Correlation coefficient if  $b_{xy} = 0.85$ ,  $b_{yx} = 0.89$ .

5. In an investigation on the machine performance the following results are obtained:

	No# of units inspected	No# of defectives
Machine 1	375	17
Machine 2	450	22

Test whether there is any significant performance of two machines at 5%LOS

OR

6. The average income of 100 people of a city is Rs 210 with a standard deviation of Rs 10. For another sample of 150 people the average income is Rs 220 with a standard deviation of Rs 12. Test significance between the difference of two means at 5% LOS

7. The following is the distribution of the daily number power failures reported in a city

No# of power failures	0	1	2	3	4	5	6	7	8	9
No# Of days	9	43	64	62	42	36	22	14	6	2

Test the goodness of fit of Poisson distribution at 5% LOS

8. Prices of shares of a company on the different day in a month were found to be

66,65,69,70,69,71,70,63,63,64 and 68. Determine whether the mean price of the share in the month is 65

9. A fast food restaurant has one drive in window . It is estimated that cars arrive according to a Poisson distribution at the rate of 2 every 5 minutes and that there is enough space to accommodate a line of 10

cars. Other arriving cars can wait outside this space ,if necessary . It takes 15 minutes on the average to fill an order, but the service time actually varies according to an exponential distribution . Determine the following

- a ) The probability that the facility is idle
- b) The expected number of customers waiting to be served

OR

10.a) A training process is considered as a two state markov chain. If it rains , it is considered to be in state 0. If it does not rain, the chain is in the state of 1. The transition probability of the markov chain is defined by  $P = \begin{bmatrix} 0.6 & 0.4 \\ 0.2 & 0.8 \end{bmatrix}$ . Find the probability of state 0 or 1 as 0.4 and 0.6 respectively.

b) Which of the following matrices are regular?

i)  $\begin{bmatrix} 1/3 & 0 \\ 1/3 & 1 \end{bmatrix}$     ii)  $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$     iii)  $\begin{bmatrix} 1/2 & 1/4 & 1 \\ 0 & 1/2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

## Model Question Paper-3 Probability and Statistics

Answer all the questions

[70 Marks]

- 1 a) If  $F(x)$  is the distribution function of  $x$  is given by  $F(X) = \begin{cases} 0 & \text{if } x \leq 1 \\ k(x-1)^4 & \text{if } 1 < x \leq 3 \\ 1 & \text{if } x > 3 \end{cases}$

Determine i)  $f(x)$  ii)  $k$  iii) mean

- b) Average number of accidents on any day on a national highway is 1.8. Determine the probability that the number of accidents are i) atleast one ii) atmost one iii) exactly one

OR

- 2 a) If  $X$  is a continuous r.v and  $Y=aX+b$  prove that  $E(Y)=aE(X)+b$  and  $V(Y)=a^2V(X)$ , where  $V$  stands for Variance
- b) In a normal distribution, 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution
3. Obtain the rank correlation coefficient for the following data

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	44	81	60	68	48	50	70

OR

4. A panel of two judges P and Q graded seven dramatic performances by independently awarding marks as follows:

Performance	1	2	3	4	5	6	7
Marks by P	46	42	44	40	43	41	45
Marks by Q	40	38	36	35	39	37	41

The eight performance, which judge Q would not attend, was awarded 37 marks by judge P. If judge Q had also been present, how many marks would be expected to have been awarded by him to the eighth performance.

- 5a) .A population consists of 5,10,14,18,13,24. Consider all possible samples of size 2 which can be drawn without replacement from the population. Find
- The mean of the population
  - Standard deviation of the population
  - The mean of the sampling distribution of means
  - Standard deviation of the sampling distribution of means
- b) Write short notes on Type I and Type II error.

OR

6. a) A normal population has a mean of 0.1 and standard deviation of 2.1. Find the probability that the mean of a sample of size 900 will be negative.
- b) 20 people were attacked by a disease and only 18 survived. Will you reject the hypothesis that the survival rate if attacked by this disease is 85% in favor of the hypothesis that is more at 5% LOS.
7. a) A random sample of size 16 values from a normal population showed a mean of 53 and a sum of squares of deviations from the mean equals to 150. Can this sample be regarded as taken from the population having 56 as mean? Obtain 95% confidence limits of the mean of the population.
- b) Write step procedure for difference of means of two independent samples.

**OR**

8. a) Explain  $\chi^2$  test for independence of attributes.  
b) The measurements of the output of two units have given the following results. Assuming that both Samples have been obtained from the normal distribution at 10% LOS. Test whether the two Populations have the same variance.

Unit -A	14.1	10.1	14.7	13.7	14.0
Unit -B	14.0	14.5	13.7	12.7	14.1

- 9.a) Assume that both arrival and service rate following Poisson distribution. The arrival rate and service rate are 25 and 25 customers /hour respectively ,at a single window in RTC reservation counter. Find  
i)  $\rho$       ii)  $L_s$       iii)  $L_q$       iv)  $W_q$       v)  $W_s$   
b) In a colour T.V manufacturing plant, a loading unit takes exactly 10 min to load 2 T.V sets into a wagon and again comes back to the position to load another set of T.V. If the arrival rate is 2 T. V sets per 20 min. Calculate the average time of T.V sets in a stationary state

**OR**

10. A professor has three pet questions , one of which occurs on every test he gives . He never uses the same question twice in successive examinations. If he used the question no#1, he tosses a coin and uses the question no# 2,if head appears. If he uses the question no# 2, he tosses two coins and use the question no#3,if both are heads. If he uses the question no#3,he tosses three coins and use the question no#1, if all are heads. In long run which question does he use most often and with how much frequency is it used.

## Model Question Paper-4 Probability and Statistics

**Answer All the following**

**[70 marks]**

1. A continuous r.v has the p.d.f  $f(x) = \{ke^{-|x|} - \infty \leq x \leq \infty$

Determine i)k ii) mean iii) variance

ii) The average number of phone calls /minute coming into a switch board between 2pm and 4pm is 2.5.Determine the probability the probability that one particular minute there will be i) 4 or fewer ii) more than 6 calls

**OR**

2a) Out of 800 families with 5 children each, how many would you expect to have

i) 3 boys ii) atleast one boy iii) either 2 girls or 2 boys

b) A random variable x has the following probability function:

x	-3	-2	-1	0	1	2	3
P(x)	k	0.1	k	0.2	2k	0.4	2k

Find i) k ii) mean iii) variance iv)E(2x+3) v)V(3x+3)

3a)The marks obtained by 10 students in two subjects are given below. Find the correlation coefficient

Subject 1	48	75	30	60	80	53	35	15	40	38
Subject 2	44	85	45	54	91	58	63	35	43	45

b) The equation of two Regression lines are  $7x - 16y + 9 = 0$  and  $5y - 4x - 3 = 0$

Find the Correlation coefficient and the means of  $x$  and  $y$ .

**OR**

4. Calculate the coefficient of correlation and lines of Regression for the following data

X	9	8	7	6	5	4	3	2	1
Y	15	16	14	13	11	12	10	8	9

5. a) The following are the average weekly losses of worker hours due to accidents in 10 industrial plant before and after a certain safety programme was put into operation:

Before	45	73	46	124	33	57	83	34	26	17
After	36	60	44	119	35	51	77	29	24	11

Test whether the safety programme is effective in reducing the number of accidents at 5% LOS

**OR**

6. a) A random sample of 500 apples was taken from a large consignment and 60 were found to be bad.Obtain 95% confidence interval for the percentage number of bad apples in the consignment.

b) Explain about i) point estimation ii) interval estimation

7. Ten specimens of copper wires drawn from a large lot have the following breaking strength(in kg) 518,572,570,568,572,578,572,569,548. Test whether the mean breaking strengths of the lot may be taken to be 518 kg weight

**OR**

8. The following is the distribution of the daily number power failures reported in a city. Test the goodness of fit of Poisson distribution at 5%LOS

No. of power failures	0	1	2	3	4	5	6	7	8	9
No. of days	9	43	64	62	42	36	22	14	6	2

9.a) Patients arrive at a clinic according to a Poisson distribution at the rate of 30 patients per hour. The waiting room does not accommodate more than 13 patients not including the one i.e, examine. Examination time per patient is exponential with mean rate 20 per hr.

- (i) Find the effective arrival rate at the clinic
  - (ii) What is the probability that an arriving patient will not wait
  - (iii) What is the expected waiting until the patient is discharged from the clinic.
- b) State Kendal's notation.

**OR**

10a) The transition probability matrix is given by  $P = \begin{bmatrix} 0.1 & 0.4 & 0.5 \\ 0.2 & 0.2 & 0.6 \\ 0.7 & 0.2 & 0.1 \end{bmatrix}$  and

$$p_0 = [0.4 \quad 0.4 \quad 0.2]$$

Find the distribution after three transitions and Find the limiting probabilities.

b) Find periodic and aperiodic states in each of the following transition probability matrices.

$$(a) \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \quad (b) \begin{bmatrix} \frac{1}{4} & \frac{3}{4} \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$$

**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  $100\Omega$ . Draw the load line if  $R_L$  is also  $100\Omega$ . [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:  $V_{CC} = 16V$ ,  $V_{BE} = 0.7V$ ,  $V_{CEQ} = 8V$ ,  $I_{CQ} = 4mA$  &  $\beta = 50$  [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]

**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  $30\Omega$ . The load resistance is  $1K\Omega$ . 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  $A_v$ ,  $A_i$ ,  $R_i$  &  $R_o$  [7].  
(b) For the emitter follower with  $R_s = 0.5K$ ,  $R_L = 50K$ ,  $h_{fe} = -50$ ,  $h_{re} = 1K$ ,  $h_{oe} = 25\mu A/V$ ,  $h_{re} =$   
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  $I_{CBO} = 50 \mu A$  when the base current is  $20\mu A$ . [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]

**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  $I_{CBO} = 20 \mu A$  when the base current is  $50 \mu A$ . [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:  $V_{CC} = 22.5V$ ,  $R_L = 5.6k\Omega$ ,  $R_C = 1k\Omega$ ,  $R_1 = 90k\Omega$ ,  $R_2 = 10k\Omega$ ,  $V_{BE} = 0.7V$  and  $\beta = 55$ . Assume  $I_B \gg I_{CO}$ . [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]

**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  $900\Omega$ . If the diode resistance and the secondary coil resistance together has a resistance of  $100\Omega$ , 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  $L=10mH$ ,  $C=100\mu F$  and  $R_L = 500\Omega$ . Calculate  $I_{DC}$ ,  $V_{DC}$  for an input  $V_i=300\sin(100t)$  [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  $h_{fe} = \beta_{dc} = 125$ , 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  $I_E$ ,  $\alpha_{dc}$  and  $\beta_{dc}$  for a transistor with  $I_B=13\mu A$ ,  $I_C=200mA$ ,  $I_{CBO}=6\mu A$ . 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  $S, S', S''$  [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  $\beta = 55$  [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]

**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  $25^{\circ}\text{C}$  with reverse saturation current,  $I_o = 25\mu\text{A}$  and at an applied voltage of  $0.2\text{V}$  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  $\pi$ -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:  $V_{CC} = 16\text{V}$ ,  $V_{BE} = 0.7\text{V}$ ,  $V_{CEQ} = 8\text{V}$ ,  $I_{CQ} = 4\text{ mA}$  &  $\beta = 50$ . [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

**B.Tech II Year I Semester Examinations**  
**DIGITAL LOGIC DESIGN**  
**(Common to Computer Science and IT)**

**MODEL PAPER-I**

Time: 3 hours

Marks: 70

**Note:** Answer any one full question from each unit. Each question carries 14 marks and may have a, b, c as sub questions.

- 1) a) What is the gray code equivalent of the Hex Number 3A7  
 b) Detect the error in the received code 1100110 using even parity  
 c) Find 9's complement of  $(25.639)_{10}$

OR

- 2) Simplify to a sum of 3 terms:  
 a)  $A'C'D' + AC' + BCD + A'CD' + A'BC + AB'C'$   
 b) Given  $AB' + AB = C$ , Show that  $AC' + A'C = B$

- 3) Explain how you convert sum of the products into product of sums. Give with example. Also minimize the following function.  $F = (0, 2, 4, 8, 9, 12, 14)$ . Show the gating circuit after minimization.

OR

- 4) Using the maps method, simplify the following expression using sum of the product form.  
 a)  $(abc)' + a(bc)' + \text{don't cares } abc + a'bc' + a'b'c$   
 b)  $Abc + (ab)'c + \text{don't cares } abc' + ab'c$

- 5) Explain how you design a combinational circuit. Show a combinational circuit for a Binary multiplier

OR

- 6) Design a combinational circuit of a magnitude comparator considering one example

- 7) Explain about the following:

- (a) latch excitation table
- (b) Merging of ow tables.

OR

- 8) Design a sequential circuit with two D flip-flops A and B. and one input x. when  $x=0$ , the state of the circuit remains the same. When  $x=1$ , the circuit goes through the state transition from 00 to 11 to 11 to 10 back to 00. and repeats.

- 9) Design PLA of the following equation  $f = a'bc + b'c + ab$

OR

- 10) Design a Random Access memory having 8 K Bytes. Identify how many address lines are needed and also word length.

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## MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

**B.Tech II Year I Semester Examinations  
DIGITAL LOGIC DESIGN  
(Common to Computer Science and IT)**

**MODEL PAPER-II****Time: 3 hours****Marks: 70**

**Note:** Answer any one full question from each unit. Each question carries 14 marks and may have a, b, c as sub questions.

- 1) a) Encode data bits 1101 into seven bit even parity hamming code  
b) Derive the Boolean algebra expression for a getting network that will have outputs 0 only when  $X=1, Y=0, Z=0$ . The outputs are to be 1 for all other cases.

OR

- 2) a) Expand  $A+BC'+ABD'+ABCD$   
b) Show  $(A+B')(B+C')(C+D')(D+A')=(A'+B)(B'+C)(C'+D)(D'+A)$

- 3) For the following expression using only NAND gates, design a combinational network.  
 $abcd+a'bc'd'+a'bc'd+a'bcd'+$  don't cares ( $a'b'c'd'+a'b'cd$ )

OR

- 4) a) Reduce and implement the following boolean function using NAND gate  
 $F=abc'+ab'+a'c+a'b'c+ab'c$   
b) Design a combinational circuit for a multiplexer

- 5) a) Explain the Analysis and design procedure for a combinational circuit. Also design a binary multiplier  
b) Explain about 4-bit Universal Shift Registers?

OR

- 6) a) Explain about the Procedure for Designing Sequential Circuits in detail?  
b) Explain the different types of memory. Explain error detection and correction read only memory.

- 7) Tabulate the truth table for an 8X4 ROM that implements the Boolean Function

$$A(x, y, z) = \sum(0, 3, 4, 6)$$

$$B(x, y, z) = \sum(0, 1, 3, 7)$$

$$C(x, y, z) = \sum(1, 5)$$

$$D(x, y, z) = \sum(0, 1, 4, 5, 7)$$

OR

- 8) a) Design PLA of the following equation  $f=a'bc+b'c+ab$   
b) Design 4-bit comparator using logic gates?

- 9) Design a Random Access memory having 8 K Bytes. Identify how many address lines are needed and also word length.

OR

- 10) Distinguish between SRAM and DRAM and draw static RAM cell?

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**MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY**

**B.Tech II Year I Semester Examinations**

**DIGITAL LOGIC DESIGN**

**(Common to Computer Science and IT)**

**MODEL PAPER-III**

**Time: 3 hours**

**Marks: 70**

**Note:** Answer any one full question from each unit. Each question carries 14 marks and may have a, b, c as sub questions.

- 1) Convert the following numbers:
  - a) 10101100111.0101 to Base 10
  - b)  $(153.513)_{10} = ( )_8$
  - c) Find  $(3250 - 72532)_{10}$  using 10's complement
  - d) Divide 01100100 by 00011001
  - e) Given that  $(292)_{10} = (1204)_b$  determine 'b'

OR

- 2) a) Explain the different logic gates in detail?  
b) Construct a table for 4 -3 -2 -1 weighted code and write 9154 using this code
- 3) a) For the function  $T(w,x,y,z) = \sum(0,1,2,3,4,6,7,8,9,11,15)$ :  
Find all prime implicants and indicate which are essential through the Kmap  
b) Reduce using mapping the following expression and implement the real minimal expression in universal logic  $F = \sum(0,2,4,6,7,8,10,12,13,15)$

OR

- 4) Draw the logic diagram using only two input NAND gate to implement the following expression  
 $F = (AB + A'B')(CD' + C'D)$

- 5) (a) Design a BCD to Excess-3 code converter using minimum number of NAND gates  
(b) Design a BCD to Gray code converter using 8:1 multiplexers.

OR

- 6) (a) Implement Half adder using 4 NAND gates  
(b) Implement full subtractor using NAND gates only.

- 7) a) Define Latch? Explain about Different types of Latches in detail?  
b) Explain about Binary Ripple Counter? What is MOD counter?

OR

- 8) a) Explain the design of Sequential circuit with an example. Show the state reduction, state assignment.  
b) Design a left shift and right shift for the following data 10110101?

- 9) Explain in detail about the PLD's

OR

- 10) Draw the PLA circuit to implement the function
  - a)  $F_1 = A'B + AC' + A'BC'$
  - b)  $F_2 = (AC + AB + BC)'$

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## MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

**B.Tech II Year I Semester Examinations  
DIGITAL LOGIC DESIGN  
(Common to Computer Science and IT)**

**MODEL PAPER-IV**

Time: 3 hours

Marks: 70

**Note:** Answer any one full question from each unit. Each question carries 14 marks and may have a, b, c as sub questions.

- 1) a) For the function  $T(w,x,y,z) = \sum(0,1,2,3,4,6,7,8,9,11,15)$ :  
Find all prime implicants and indicate which are essential through the Kmap  
b) Design a circuit which will find the 2's complement of a 4 bit binary number. Use one full adder, 3 half adders and any additional gates.

OR

- 2) a) Perform the subtraction with the following unsigned binary numbers by taking the 2's complement of the subtrahend:  
i)  $100 - 110000$   
ii)  $11010 - 1101$ .  
b) Perform arithmetic operation indicated below. Follow signed bit notation:  
i)  $001110 + 110010$   
ii)  $101011 - 100110$ .

- 3) a) Explain the steps for reducing Boolean function using K-Map ?  
b) Construct half subtractor using NAND gates?

OR

- 4) a) Implement the following function using only NOR gates.  $F = a(b+cd) + bc'$   
b) What is don't care condition?

- 5) a) Explain the design procedure of Full Adder with diagram  
b) Design 2-digit BCD adder with the help of binary adders?

OR

- 6) Design an 8421 to 2421 BCD Converter and draw its logic diagram

- 7) a) Explain the Ripple counter design. Also a decade counter design  
b) Design Johnson counter and state its advantages and disadvantages?

OR

- 8) What is the difference between synchronous and Asynchronous sequential logic. Design Asynchronous sequential logic with an example and show race Free State assignment hazard.

- 9) a) Explain about memory decoding?  
b) Explain the read and write operation a RAM can perform?

OR

- 10) Write a short note on  
a) Address and data bus  
b) Sequential memory  
c) RAM  
d) Cache memory

**MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY**

**B.Tech II Year I Semester Examinations**

**DIGITAL LOGIC DESIGN**

**(Common to Computer Science and IT)**

**MODEL PAPER-V**

**Time: 3 hours**

**Marks: 70**

**Note:** Answer any one full question from each unit. Each question carries 14 marks and may have a, b, c as sub questions.

- 1) a) Explain the importance of gray code.  
b) Implement the following function using Logic gates  
 $A'BC + A'B'C + ABC' + AB'C + A'BC' + A'B'C'$

OR

- 2) a) Let  $f = \sum(5,6,13)$  and  $f_1 = \sum(0,1,2,3,5,6,8,9,10,11,13)$ . Find  $f_2$  such that  $f = f_1 \times f_2$ .  
b) Find all minimal four variable functions which assume the value 1 when the minterms 4,10,11,13 are equal to 1 and assume the value 0 when the minterms 1,3,6,7,8,9,12,14 are equal to 1.

- 3) a) Derive the Boolean expression for a two input Ex-OR gate to realize with two input NAND gates without using complemented Variables and draw the circuit  
b) Expand  $A + BC' + ABD' + ABCD$  to minterms and maxterms

OR

- 4) a) Reduce the following expression using K-Map and implement using Logic gates .  
 $F = (a+b')(cd+e')$   
b) Reduce using mapping the expression  $F = \pi(0,1,3,5,6,7,13,15)$  and implement the real minimal expression in universal logic

- 5) a) Design a circuit to convert Xs-3 code to BCD code using 4 bit full adders  
b) Implement the following multiple output combinational circuit using 3 line to 8 line decoder

$$F_1 = \sum m(0,1,2,6)$$

$$F_2 = \sum m(2,4,6)$$

$$F_3 = \sum m(0,1,5,6)$$

OR

- 6) Show that 16:1 MUX can be realized using 4 to 1 Muxes

- 7) a) Explain combinational circuit design considering one example.  
b) Explain the circuit diagram of full subtractor and full adder?

OR

- 8) a) Explain the difference between Asynchronous and Synchronous sequential circuits.  
b) Define fundamental mode operation.  
c) Explain the difference between stable and unstable states.  
d) What is the difference between an internal state and total state?

9) Implement the following functions using PAL

a)  $F1 = abc + a'b'c + abc' + ab'c' + ab' + a'bc$

b)  $F2 = a'b'c' + a'b'c + ab'c' + a'bc$

OR

10) a) Explain about memory hierarchy in terms of capacity and access time.

b) Explain about various memories?

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Code No: R15A0503

**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**

(Autonomous Institution – UGC, Govt. of India)

**II B. Tech I Semester Supplementary Examinations, May 2018****Mathematical Foundation of Computer Science****(CSE& IT)**

<b>Roll No</b>									
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**Time: 3 hours****Max. Marks: 75****Note:** This question paper contains two parts A and B

Part A is compulsory which carries 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.

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**PART – A****(25 Marks)**

1.

- (a) Represent the proposition “If Sachin hits century then India will win the match” into symbolic form and also its negation. (2M)
- (b) Provide a proof by Indirect method of the following statement, “If x is odd then  $x^2$  is odd”. (3M)
- (c) Define lattice and write its properties. (2M)
- (d) Differentiate between equivalence relation and partial ordering relation. (3M)
- (e) Explain Pigeon hole principle with one example. (2M)
- (f) In how many ways can we draw a heart or queen from a pack of cards. (3M)
- (g) Define recurrence relation and explain recurrence relation for Fibonacci relation. (2M)
- (h) Solve recurrence relation  $a_n - 7a_{n-1} + 10a_{n-2} = 0$ ,  $a_0 = 10$ ,  $a_1 = 41$ . (3M)
- (i) Define Isomorphism in graphs and explain with example. (2M)
- (j) Define complete graph and wheel graph. (3M)

**PART – B****(50 Marks)****SECTION – I**

- 2 a). Show that  $S \cup R$  is tautologically implied by  $(P \cup Q) \cup (P \rightarrow R) \cup (Q \rightarrow S)$ . (6M)
- b). State and explain the rules that that can generate a well formed formula (4M)

**(OR)**

- 3 a). Define PDNF and find PDNF for  $(\sim P \leftrightarrow R) \cup (Q \leftrightarrow P)$ . (6M)
- b). Explain any five rules of inference with examples . (4M)

**SECTION – II**

- 4 a) Define a semi group and Monoid. Give an example of a Monoid which is not group. Justify your answer (5M)
- b) Let  $A = \{1, 2, 3, 5, 6, 10, 15, 30\}$ , show that the relation ‘divides’ is a partial ordering on A and draw Hasse diagram (5M)

**(OR)**

- 5 a). Let  $G = \{-1, 0, 1\}$ , verify whether G forms a group under usual addition. (5M)
- b). If a, b are any two elements of a group  $(G, .)$  which commute, show that  $a^{-1}$  and b commute,  $b^{-1}$  and commute,  $a^{-1}$  and  $b^{-1}$  commute. (5M)

### SECTION – III

- 6 a). Use multinomial theorem to expand  $(x_1+x_2+x_3+x_4)^4$ . (5M)  
b). Find the number of integers between 1 and 250 which are divisible by any of the integers 2,3,5 or 7 and hence find the number of integers between 1, 250 which are not divisible by 2, 3, 5 or 7. (5M)

(OR)

- 7 a). How many ways can the letters of the word ALGORITHM be arranged in a row if A and L must remain together as a unit?( 5M)  
b). From a group of 10 Professors how many ways can a committee of 5 members be formed so that at least one of Professor B will be included? (5M)

### SECTION – IV

- 8 a). Solve recurrence relation  $a_n-4a_{n-1}+4a_{n-2}=0$ ,  $a_0=0$ ,  $a_1=1$ . (5M)  
b). Explain Fibonacci relation with suitable examples and also solve it. (5M)

(OR)

- 9 a). Solve  $a_n - 5a_{n-1} + 6a_{n-2} = (n+1)^2$ ,  $a_0=0$ ,  $a_1=1$ . (5M)  
b. Solve  $a_n - 7a_{n-1} + 12a_{n-2} = 0$ ;  $n \geq 2$  by generating function. (5M)

### SECTION – V

- 10 a). Write Kruskal's Algorithm and explain it with an example. (5M)  
b). Prove that complete graph of 5 vertices is non planar. (5M )

(OR)

- 11 a). Write an algorithm for depth first search spanning tree. (5M)  
b). Define chromatic number and explain it with four examples. (5M )

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Code No: XXXXX

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
B.Tech II Year I Semester Examinations
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Common to Computer Science and IT)

Time: 3 hours

Max Marks: 70

Note: Answer any one full question from each unit. Each question carries 14 marks and may have a, b, c as sub questions.

1. Show that 't' is a valid conclusion from the following premises p -> q, q -> r, r -> s, ~s and p ^ t

OR

2. Show that the following implication without constructing truth table

(i) (p -> q) -> q => (p v q)

(ii) p -> q => p -> p ^ q

3. Let X={1,2,3} and f,g,h & s are the functions from X to X given by

f= {<1,2>,<2,3>,<3,1>}

g= {<1,2>,<2,1>,<3,3>}

h= {<1,1>,<2,2>,<3,1>}

s= {<1,1>,<2,2>,<3,3>}

Find fOg, gOf, fOhOg, sOg, gOs, sOs, fOs, fOh, fOsOh, fOf.

OR

4. Draw Hasse diagram represent the partial order {(A,B): A <= B} on the power set p(s) where s= {a,b,c} where <= represent subset relation

5. a) Determine the number of integer between 1 and 10,000,000 have the sum of digits equal to 18

b) Determine the number of ways possible to wear 5 rings on 4 fingers.

OR

6. Illustrate pigeon hole principle and its applications

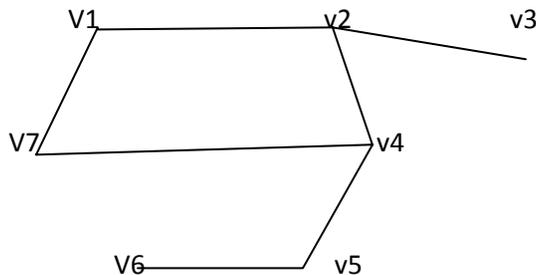
7. Solve the recurrence relation using generating function a\_n - 6a\_{n-1} = 0 for n >= 1 where a\_0 = 1

OR

8. Solve the recurrence relation of Fibonacci series

9. (a) Define Cycle?

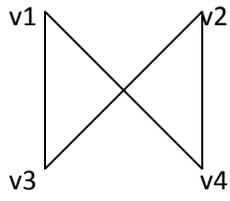
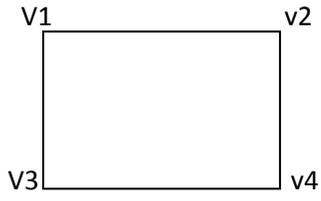
(b) Apply BFS algorithm to form the spanning tree? (Figure)



OR

10. Verify the following graphs are isomorphic or not?

(Figure)



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Code No: XXXXX

**MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**B.Tech II Year I Semester Examinations**  
**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**  
**(Common to Computer Science and IT)**

**Time: 3 hours**

**Max Marks: 70**

**Note:** Answer any one full question from each unit. Each question carries 14 marks and may have a, b, c as sub questions.

1. Show that  $\sim p$  follows from the set of premises  $(r \rightarrow \sim q), r \vee s, s \rightarrow \sim q, p \rightarrow q$  using indirect method of proof  
**OR**

2. Obtain POS of the following formulas

(i)  $(P \wedge Q \wedge R) \vee (\sim P \wedge R \wedge Q) \vee (\sim P \wedge \sim Q \wedge \sim R)$

(ii)  $P \vee (\sim P \rightarrow (Q \vee (\sim Q \rightarrow R)))$

3. Define the following terms (i) Group (ii) Abelian Group (iii) Semi Group (iv) Sub Group  
**OR**

4. Find all the properties that satisfies for the following algebraic systems under the binary operations 'X' and '+'.  
(a) Odd integer (b) All positive integers

5. a) Find the number of non negative integral solutions to  $X_1 + X_2 + X_3 + X_4 + X_5 = 10$   
b) Find the number of arrangements of letters "MISSISSIPPI".  
**OR**

6. a) In how many ways can 23 different books be given to 5 students so that 2 of the students will have 4 books each and other 3 will have 5 books each.  
b) Using multinomial theorem, expand  $(2X - 3Y + 4Z)^3$

7. Solve the recurrence relation  $a_n - 7a_{n-1} + 12a_{n-2} = 0$  for  $n \geq 2$  where  $a_0 = 1, a_1 = 2$   
**OR**

8. Find the general expression for a solution to the recurrence relation  $a_n - 5a_{n-1} + 6a_{n-2} = n(n-1)$  for  $n \geq 2$

9. Find the Chromatic number of the following graphs  
(a) Complete Graph ( $K_3$ )  
(b) Complete Bipartite Graph ( $K_{2,3}$ )  
(c) Regular Graphs ( $K_3$ )  
**OR**

10. Explain and illustrate BFS and DFS with examples?

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Code No: XXXXX

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY
B.Tech II Year I Semester Examinations
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Common to CSE and IT)

Time: 3 hours

Max Marks: 70

Note: Answer any one full question from each unit. Each question carries 14 marks and may have a, b, c as sub questions.

- 1. Obtain POS of the following formulas
(i) (P ^ Q ^ R) V (~P ^ R ^ Q) V (~P ^ ~Q ^ ~R)
(ii) P V (~P -> (Q V (~Q -> R)))

OR

- 2. Using automatic theorem (P V Q) ^ (Q -> R) ^ (P -> M) => (R V M)
3. Draw the Hasse diagram for X={2,3,6,24,36,48} and relation <= be such that x<=y, if x divides y.

OR

- 4. Define the following terms (i) Group (ii) Abelian Group (iii) Semi Group (iv) Sub Group
5. Using binomial theorem prove that 3^n = sum\_{i=0}^n nCr(2^i)

OR

- 6. In how many ways can 23 different books be given to 5 students so that 2 of the students will have 4 books each and other 3 will have 5 books each?
b) Using multinomial theorem, expand (2X-3Y+4Z)^3

- 7. Solve the recurrence relation a\_n - 7a\_{n-1} + 12a\_{n-2} = 0 for n >= 2 where a\_0=1, a\_1=2

OR

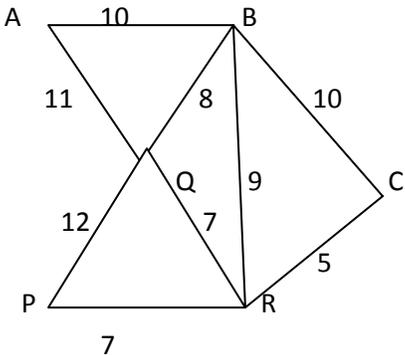
- 8. Solve the recurrence relation of Fibonacci series

OR

- 9. Find the Chromatic number of the following graphs
(a) Complete Graph (K\_3)
(b) Complete Bipartite Graph (K\_{2,3})
(c) Regular Graphs (K\_3)

OR

- 10. Define Minimal Spanning Tree? Using Kruskal's Algorithm find a minimal spanning tree for the weighted graph as shown below Figure



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**MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**B.Tech II Year I Semester Examinations**  
**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**  
**(Common to Computer Science and IT)**

**Time: 3 hours**

**Max Marks: 70**

**Note:** Answer any one full question from each unit. Each question carries 14 marks and may have a, b, c as sub questions.

1. Using automatic theorem  $(PVQ) \wedge (Q \rightarrow R) \wedge (P \rightarrow M) \Rightarrow (RVM)$

**OR**

2. Show that the following implication without constructing truth table

(i)  $(p \rightarrow q) \rightarrow q \Rightarrow (p \vee q)$

(ii)  $p \rightarrow q \Rightarrow p \rightarrow p \wedge q$

3. Find all the properties that satisfies for the following algebraic systems under the binary operations 'X' and '+'.  
(a) Odd integer                      (b) All positive integers

**OR**

4. Draw the Hasse diagram for  $X = \{2, 3, 6, 24, 36, 48\}$  and relation  $\leq$  be such that  $x \leq y$ , if x divides y.

5. What is the coefficient of  $x^3y^7$  in (a)  $(x+10)^{10}$     (b)  $(2x-9y)^{10}$

**OR**

6. Illustrate pigeon hole principle and its applications

7. Solve the recurrence relation using generating function  $a_n - 6a_{n-1} = 0$  for  $n \geq 1$  where  $a_0 = 1$

**OR**

8. Solve the recurrence relation of Fibonacci series

9. (a) Define Cycle?

(b) Apply DFS algorithm to form the spanning tree by taking own graph.

**OR**

10. Explain the following

(a) Isomorphism and sub graphs

(b) Hamilton Paths

(c) Planar Graph

(d) Dual of a planar graph

Code No: XXXXX

**MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**B.Tech II Year I Semester Examinations**  
**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**  
**(Common to Computer Science and IT)**

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

**Note:** Answer any one full question from each unit. Each question carries 14 marks and may have a, b, c as sub questions.

1. Show that  $\sim p$  follows from the set of premises  $(r \rightarrow \sim q), r \vee s, s \rightarrow \sim q, p \rightarrow q$  using indirect method of proof

**OR**

2. Obtain POS of the following formulas

(i)  $(P \wedge Q \wedge R) \vee (\sim P \wedge R \wedge Q) \vee (\sim P \wedge \sim Q \wedge \sim R)$

(ii)  $P \vee (\sim P \rightarrow (Q \vee (\sim Q \rightarrow R)))$

3. Define the following terms (i) Group (ii) Abelian Group (iii) Semi Group (iv) Sub Group

**OR**

4. Let  $X = \{1, 2, 3\}$  and  $f, g, h$  &  $s$  are the functions from  $X$  to  $X$  given by

$$f = \{ \langle 1, 2 \rangle, \langle 2, 3 \rangle, \langle 3, 1 \rangle \}$$

$$g = \{ \langle 1, 2 \rangle, \langle 2, 1 \rangle, \langle 3, 3 \rangle \}$$

$$h = \{ \langle 1, 1 \rangle, \langle 2, 2 \rangle, \langle 3, 1 \rangle \}$$

$$s = \{ \langle 1, 1 \rangle, \langle 2, 2 \rangle, \langle 3, 3 \rangle \}$$

Find  $f \circ g, g \circ f, f \circ h \circ g, s \circ g, g \circ s, s \circ s, f \circ s, f \circ h, f \circ s \circ h, f \circ f$

5. a) Find the number of non negative integral solutions to  $X_1 + X_2 + X_3 + X_4 + X_5 = 10$

b) In how many ways can 23 different books be given to 5 students so that 2 of the students will have 4 books each and other 3 will have 5 books each?

c) Using multinomial theorem, expand  $(2X - 3Y + 4Z)^3$

**OR**

6. a) In how many ways can 23 different books be given to 5 students so that 2 of the students will have 4 books each and other 3 will have 5 books each.

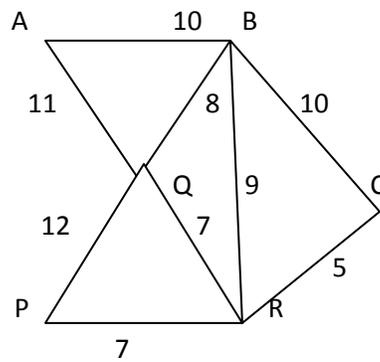
b) Find the number of arrangements of letters "SAIRAMRAM".

7. Find the recurrence relation and initial condition for the sequence 2, 10, 50, 250 and also find general term

**OR**

8. Find the general expression for a solution to the recurrence relation  $a_n - 5a_{n-1} + 6a_{n-2} = n(n-1)$  for  $n \geq 2$

9. Define Minimal Spanning Tree? Using Kruskal's Algorithm find a minimal spanning tree for the weighted graph as shown below (Figure)



**OR**

10. Explain and illustrate BFS and DFS with examples?

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**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**

(Autonomous Institution – UGC, Govt. of India)

**Model Papers for II B.Tech I Semester**

**Data structures using C++**

(IT)

Paper -1

<b>Roll No</b>									
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**Time: 3 hours**

**Max. Marks: 70**

**Note:** This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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**Section-I**

- Q. No. 1 a) Explain all asymptotic notations with examples? (7M)  
b) What is Linear search? Write a C++ Program to implement Linear search technique? (7M)

**OR**

- Q. No. 2 a) What is Binary search? Write a C++ Program to implement binary search technique? (7M) b)What is the area of application of Linear and binary search. (7M)

**Section-II**

- Q. No. 3 a) What is a Data structures? Explain various types with example. (7M)  
b) Explain Stack data structure with neat diagrams? (7M)

**OR**

- Q. No. 4 a) Explain Queue data structure with neat diagrams? (7M)  
b) Write a C++ program for Static implementation of Queue ADT (7M)

**Section-III**

- Q. No. 5 a) What are priority Queues? What are the applications of priority Queue (7M)  
b) What is a heap? Explain various types of heaps? (7M)

**OR**

- Q. No.6 a) Implement priority Queue using heap (7M)  
b) Explain heap sort with an example. (7M)

**Section-IV**

- Q. No. 7 a) Give an ADT for dictionary? (7M)  
b) What are the two methods of representing linear list? Explain with suitable examples?(7M)

**OR**

- Q. No. 8 a) What is double hashing? Compare: Quadratic probing and double hashing (7M)  
b) What is rehashing? Explain in detail. ( 7M)

**Section-V**

- Q. No. 9 a) what is a Binary Search Tree (BST)? Create a BST for the following sequence of numbers: 55, 36, 70, 23, 89, 100, 58, 39, 41, 60, 65, and 25. (7M)  
b) Write Pre order, In order and Post order traversal for the above constructed tree?

**OR**

- Q. No. 10 a) Define AVL Tree? Explain the operations on AVL tree with illustrations? (7M)  
b) Explain in detail about rotations of AVL tree? . (7M)

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Code No: XXXXXXXX

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**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**

(Autonomous Institution – UGC, Govt. of India)

**Model Papers for II B.Tech I Semester**

**Paper -2**

**Data structures using C++**

( IT)

<b>Roll No</b>									
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**Time: 3 hours**

**Max. Marks: 70**

**Note:** This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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**Section-I**

Q. No. 1 . Explain the technique of bubble sort. Sort the following elements using bubble sort.  
98 ,56 ,12 ,23, 86, 29, 42, 34, 67 and write a c++ program to implement bubble sort. (14M)

**OR**

Q. No.2. Explain selection sort ? Sort the following elements using selection sort. 98 ,56 ,12 ,23, 86, 29,  
42, 34, 67 and Write a C++ program to implement selection sort. (14M)

**Section-II**

Q. No. 3 a)What are primitive data types?. Explain ADT? (7M)  
b) Explain Linear data structures. (7M)

**OR**

Q. No. 4 Write a C++ program to implement Circular linked list ADT. (14M)

**Section-III**

Q. No. 5. What is an external sort? Explain external sorting model. (14M)

**OR**

Q. No. 6. Construct Max heap and Min heap for the following instance:  
12,5,65,2,33,24,89,23,25,15,17,38,48,23. (14M)

**Section-IV**

Q. No. 7 What is a skip list? Give its representation and write various operations that can be performed  
on skip list in detail (14M)

**OR**

Q. No. 8 What is Dictionary? Write C++ code for implementation of Dictionary with Single linked list(14M)

**Section-V**

Q. No. 9 What is a balanced tree? Give various types of balance trees. Discuss in detail (14 M)

**OR**

Q. No. 10 . What is an AVL Tree? Construct an AVL tree for the following elements:  
2,10,12,3,35,8,40,5,60,18,7,90,28,93 and then delete 5,18. (14M)

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**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**

(Autonomous Institution – UGC, Govt. of India)

**Model Papers for II B.Tech I Semester****Data structures using C++****(IT)****Paper -3**

<b>Roll No</b>										
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**Time: 3 hours****Max. Marks: 70**

**Note:** This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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**Section-I**

Q. No. 1 . Explain insertion sort ? Sort the following elements using Insertion sort. 98 ,56 ,12 ,23, 86, 29, 42, 34, 67 Write a C++ program to implement insertion sort (14M)

**OR**

Q. No.2. Explain Merge sort ? Sort the following elements using Merge sort. 45 ,23 ,20 ,50, 70, 24, 33, 43, 47 Write a C++ program to implement Merge sort . (14M)

**Section-II**

Q. No. 3 a) What is a linked list? what are various types of linked lists? (7M)

b) Explain various operations on single linked list. Explain each with a neat sketch (7M)

**OR**

Q. No. 4 Write a C++ program to implement Doubly linked list ADT(14M)

**Section-III**

Q. No. 5. What is an external sort? Explain how Quick sort can be realized as external sorting technique, illustrate with an example.(14M)

**OR**

Q. No. 6. Compare and Contrast all external sorting techniques and give applications of each of them. (14M)

**Section-IV**

Q. No. 7 a) Explain the ways of implementing dictionaries and give applications of dictionaries. (14M)

**OR**

Q. No. 8 What is a collision? What are various collision resolution techniques and Give the characteristics of Good hashing function ( 14 M)

**Section-V**

Q. No. 9 . What is a B-Tree? Construct a B-tree of order 3 for the following elements: 25,10,20,30,35,80,40,50,60,82,70,90,85,93. (14 M)

**OR**

Q. No. 10 . a) Explain threaded binary trees?(7M)

b) Prove that height of AVL tree with n elements is  $O(\log(n))$ .(7M)

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**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**

(Autonomous Institution – UGC, Govt. of India)

**Model Papers for II B.Tech I Semester****Data structures using C++****(IT)****Paper -4**

<b>Roll No</b>										
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**Time: 3 hours****Max. Marks: 70**

**Note:** This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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**Section-I**

Q. No. 1 . Explain Quick sort ? Sort the following elements using Quick sort. 9 ,6 ,12 ,2, 8, 29, 22, 4, 67,98, 30 and 48 Write a C++ program to implement Quick sort (14M)

**OR**

Q. No.2. a) Compare all sorting techniques with their time complexities.(7M)  
b) What is stable sort? Explain which sorting techniques are stable sorts why?(7M)

**Section-II**

Q. No. 3 a) What is LIFO? Differentiate between Stack and array (7M)  
b) What are various applications of stack? Explain with examples (7M)

**OR**

Q. No. 4 Write a C++ program to implement single linked list ADT. (14M)

**Section-III**

Q. No. 5. Explain Heap sort ? Sort the following elements using Heap sort. 9 ,6 ,12 ,2, 8, 29, 22, 4, 67,98, 30 and 48 Write a C++ program to implement Heap sort (14M)

**OR**

Q. No. 6.Explain multi way merge and poly Phase merge. (14M)

**Section-IV**

Q. No. 7 a) Explain the problem associated with linear probing (7M)  
b) Explain the concept of extensible hashing with suitable example.

**OR**

Q. No. 8 a) Explain algorithms for performing various operations on skip list.(7M).  
b) Differentiate between skip list and linked list.(7M)

**Section-V**

Q. No. 9 Implement an AVL tree such that every node has a pointer to the parent. Design a procedure to insert and another to delete a node from the AVL tree. You must take care of the height balance and empty tree. (14 M)

**OR**

Q. No. 10 a) Explain different types of graph representation?(7M)  
b) Explain BFS and DFS with examples.(7M)

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**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**  
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**II B.Tech I Semester Model Paper**  
**Computer Organisation**  
**SET-1**

<b>Roll No</b>									
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**Time: 3 hours**

**Max. Marks: 70**

**Note:** This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing **ONE** Question from each SECTION and each Question carries 14 marks.

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**SECTION – I**

- 1.a) Explain the bus structure in detail with neat diagram.  
b) Explain about Floating-point representation.

(OR)

- 2 a) Describe the connections between the processor and memory with a diagram.  
b) What are the functions of ALU.

**SECTION – II**

- 3 a) Explain various types of computer registers with block diagrams  
b) Explain address sequencing in micro programmed control.

(OR)

- 4a) What is Instruction Cycle ? Briefly explain with state diagram.

- b) Explain various instruction formats and write various instruction formats for  $X=(A+B)*(C+D)$ .

**SECTION – III**

- 5 a) Explain the different Addressing modes with numerical example.  
b) Explain clearly the three types of CPU organizations.

(OR)

- 6a) Explain input-output processor in detail.

- b) With a neat diagram, explain the instruction pipeline processing in detail

**SECTION – IV**

7. With the help of a block diagram. Explain DMA transfer in detail.

(OR)

- 8 a) Explain the mechanism of Asynchronous data transfer.

- b) Give the details of handshaking signals for data transfer using source initiated data transfer.

**SECTION – V**

- 9a) How is the Associative memory suited to do parallel searches by data association.  
Explain with the help of a block diagram.

- b) What is Virtual Memory ? What is its advantage.

(OR)

- 10 Explain in detail various mapping techniques in cache memory.

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**II B.Tech I Semester Model Paper**  
**Computer Organisation**

**SET-2**

<b>Roll No</b>									
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**Time: 3 hours**

**Max. Marks: 70**

**Note:** This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing **ONE** Question from each SECTION and each Question carries 14 marks.

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**SECTION-I**

1. With a neat sketch, explain in detail about the functional units of computers.  
(OR)
2. Design one stage of an Arithmetic logic shift unit and then explain it with the help of function table.

**SECTION – II**

3. (a) What is the difference between a direct and an indirect address instruction? How many references to memory are needed for each type of instruction to bring an operand into a processor register?  
(b) Show and explain the input-out configuration.  
(OR)

4. Explain the instruction cycle with the help of a flow chart.

**SECTION – III**

5. Explain all addressing modes with numerical examples and diagrams.  
(OR)

6. (a) Draw and explain a flowchart of the hardware multiply algorithm.  
(b) Illustrate the binary division process through a numerical example.

**SECTION – IV**

7. (a) Draw a space-time diagram for a six-segment pipeline showing the time it takes to process eight tasks.  
(5M)  
(b) With the help of flow chart explain how the instruction cycle in the CPU can be processed with a four-segment Pipeline.

(OR)

8. Design Parallel priority interrupt hardware for a system with eight interrupt sources and then explain the same.

**SECTION – V**

9. (a) Explain the following Auxiliary memory devices:
  - i. Magnetic disks
  - ii. Magnetic tape
 (b) Discuss the block diagram of an Associative memory.

(OR)

10. Explain briefly about memory hierarchy

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**II B.Tech I Semester Model Paper**  
**Computer Organisation**  
**SET-3**

<b>Roll No</b>									
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**Time: 3 hours****Max. Marks: 70**

**Note:** This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing **ONE** Question from each SECTION and each Question carries 14 marks.

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**SECTION-I**

- 1 a) What is bus? Draw the figure to show how functional units are interconnected using a bus and explain it  
 b) Differentiate between fixed point and floating point representation

(OR)

2. a) What is register transfer language? Explain the basic symbols used in register transfer.  
 b) Explain the design of accumulator logic

**SECTION-II**

3. a) Explain the basic computer instruction formats  
 b) Explain the different types of addressing modes
4. a) List and explain the steps involved in the execution of a complete instruction  
 b) What is Micro operation? Briefly explain the arithmetic micro operations?

(OR)

**SECTION-III**

5. a) An instruction is stored at location 300 with its address field at location 301. The address field has the value 400. A processor register r1 contains the number 200. Evaluate the effective address if the addressing mode of the instruction is i) Direct ii) Immediate iii) Relative iv) Register Indirect (8M)  
 b) Explain the operation of a Micro programmed control unit using a diagram (8M)

(OR)

6. a) Multiple  $(-7)_{10}$  with  $(3)_{10}$  by using Booth's multiplication. Give the flow table of the multiplication b) Draw the circuit of a BCD adder / subtractor and explain its operations

**SECTION-IV**

7. Draw the block diagram of a DMA controller and explain its functioning?  
 b) Discuss any five key differences between subroutine and interrupt service routines

(OR)

8. Explain in detail about arithmetic and instruction pipeline.

### **SECTION-V**

9. a) Compare and contrast between Asynchronous DRAM and Synchronous DRAM.

b) What is cache memory? Explain the different mapping functions

(OR)

10. a) Discuss about the virtual memory? Discuss about the mapping of virtual address to memory table. b) Discuss about set-associative mapping.

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**II B.Tech I Semester Model Paper**  
**Computer Organisation**

**SET-4**

<b>Roll No</b>									
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**Time: 3 hours****Max. Marks: 70**

**Note:** This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing **ONE** Question from each SECTION and each Question carries 14 marks.

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**SECTION-I**

1. a) Define Data representation. Explain different data representations in detail.  
b) Write about bus structure.

(OR)

2. Explain in detail about various arithmetic, logic and shift micro operations.

**SECTION-II**

3. Explain hardwired control unit and micro programmed control unit.

(OR)

4. Explain different types of computer instruction formats.

**SECTION-III**

5. Explain all Addressing modes with numerical example.

(OR)

6. Explain data transfer, data manipulation and program control instructions.

**SECTION-IV**

7. . Describe in detail about input-output-processor (IOP) organization

(OR)

8. Explain the DMA transfer technique with the block diagram.

**SECTION-V**

9. Write short notes on the following

- a) Virtual memory
- b) Hit ratio
- c) Cache coherency

(OR)

- 10.a) Discuss the different mapping techniques used in cache memories and their relative merits and demerits

- b) Explain briefly about memory hierarchy