


SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR

Siddharth Nagar, Narayanavanam Road – 517583

MODAL QUESTION BANK (DESCRIPTIVE)
Subject: Probability & Statistics, Numerical Methods

Course & Branch: B.Tech–EEE

Code: 18HS0833

Year & Sem: II-II

Regulation: R18

UNIT –I

 1. a) If $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{4}$ $P(A \cap B) = \frac{1}{8}$ then $P(A \cup B)$ [2M]

 b) If $P(A^c) = \frac{3}{8}$, $P(B^c) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{4}$ then find $P\left(\frac{A}{B}\right)$ [2M]

c) State the Baye's Theorem

 d) If the probability density of random variable is given by $f(x) = \begin{cases} k(1-x^2), & \text{for } 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$
 find the value of k? [2M]

e) A random variable X has the following probability function

x	1	2	3	4	5	6	7	8
P(x)	1/36	2/36	3/36	4/36	5/36	6/36	7/36	8/36

 find the value of $P(x \leq 2)$ [2 M]

2. a) A class consists of 6 girls and 10 boys. If a committee of 3 is chosen at random from the class, find the Probability that (i)3 boys are selected (ii)exactly 2 girls are selected [4 M]

b) Two cards are selected at random from 10 cards numbered 1 to 10. Find the probability that the sum is even if (i) The two cards are drawn together. (ii) The two cards drawn one after other with replacement. [6 M]

3. a) Three students A,B,C are in running race. A and B have the same Probability of winning and each is twice as likely to win as C. Find the Probability that B or C wins [5 M]

 b) Determine (i) $P\left(\frac{B}{A}\right)$ (ii) $P\left(\frac{A}{B^c}\right)$ if A and B are events with $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{4}$,

 $P(A \cup B) = \frac{1}{2}$. [5 M]

4. a) In a certain town 40% have brown hair, 25% have brown eyes and 15% have both brown hair and brown eyes. A person is selected at random from the town.

i) If he has brown hair, what is the probability that he has brown eyes also?

ii) If he has brown eyes, determine the probability that he does not have brown hair? [6 M]

 b) The probability that students A, B, C, solve the problem are $\frac{1}{3}$, $\frac{2}{5}$, $\frac{1}{5}$ and $\frac{1}{4}$ respectively If all of them try to solve the problem, what is the probability that the problem is solved. [4M]

5. Two dice are thrown. Let A be the event that the sum of the point on the faces is 9. Let B be the event that at least one number is 6.

Find (i) $P(A \cap B)$ (ii) $P(A \cup B)$ (iii) $P(A^c \cup B^c)$ (iv) $P(A^c \cap B^c)$ (v) $P(A \cap B^c)$ [10 M]

6. In a certain college 25% of boys and 10% of girls are studying mathematics. The girls constitute 60% of the student body. (a) What is the probability that mathematics is being studied? (b) If a student is selected at random and is found to be studying mathematics, find the probability that the student is a girl? (c) a boy [10 M]

7. Two dice are thrown. Let X assign to each point (a, b) in S the maximum of its numbers i.e, $X(a, b) = \max(a, b)$. Find the probability distribution. X is a random variable with $X(s) = \{1, 2, 3, 4, 5, 6\}$. Also find the mean and variance of the distribution. [10 M]

8. A random variable X has the following probability function

X	0	1	2	3	4	5	6	7
P(x)	0	K	2K	2K	3K	K ²	2K ²	7K ² +K

Determine (i) K (ii) Evaluate $P(X \geq 6)$ and $P(0 < X < 5)$ (iii) if $P(X \leq K) > 1/2$, find the minimum value of K (iv) variance. [10 M]

9. a) Find the mean and variance of the uniform probability distribution given by $f(x) = \frac{1}{n}$ for $x = 1, 2, \dots, n$. [5 M]

b) If a random variable has a Probability density f(x) as $f(x) = \begin{cases} 2e^{-2x}, & \text{for } x > 0 \\ 0, & \text{for } x \leq 0 \end{cases}$

Find the Probabilities that it will take on a value (i) Between 1 & 3 (ii) Greater than 0.5 [5 M]

10. Probability density function of a random variable X is $f(x) = \begin{cases} \frac{1}{2} \sin x, & \text{for } 0 \leq x \leq \pi \\ 0, & \text{elsewhere} \end{cases}$. Find the mean,

mode and median of the distribution and also find the probability between 0 and $\frac{\pi}{2}$. [10 M]

UNIT –II

1. a) Define Binomial distribution. [2 M]
 b) A fair coin is tossed six times. Find the Probability of getting four heads. [2 M]
 c) Define Poisson distribution. [2 M]
 d) If a bank received on the average 6 bad cheques per day, find the probability that it will receive bad cheques on any given day. [2 M]
 e) Define Normal distribution. [2 M]

2. a) Derive mean and variance of Binomial distribution. [6 M]
 b) 20% of items produced from a factory are defective. Find the probability that in a sample of 5 chosen at random (i) one is defective (ii) $p(1 < x < 4)$ [4 M]

3. a) Fit a Binomial distribution to the following frequency distribution: [8 M]

x	0	1	2	3	4	5
f	2	14	20	34	22	8

- b) The mean and variance of a binomial distribution are 4 and $\frac{4}{3}$. Find $p(X \geq 1)$. [2M]
4. a) Out of 800 families with 5 children each, how many would you expect to have (i) 3 boys (ii) 5 girls (iii) either 2 or 3boys? Assume equal probabilities for boys and girls. [6M]
 b) Two dice are thrown five times. Find the probability of getting 7 as sum i) at least once (ii) $p(1 < x < 5)$ [4M]
5. a) Derive mean and variance of Poisson distribution. [6 M]
 b) If 2% of light bulbs are defective. Find the probability that (i) At least one is defective (ii) $p(1 < x < 8)$ in a sample of 100 [4 M]
6. a) Fit a Poisson distribution to the following data [8 M]

x	0	1	2	3	4	5	Total
f	142	156	69	27	5	1	400

- b) If the mean of a Poisson distribution is 1.8 then find $p(X > 1)$. [2M]
7. a) An insurance agent policies of 5 men all of identical age and good in health. The probability that a man of this age will be alive 30 years is $\frac{2}{3}$. Find the probability that in 30 years. (i) At least one man (ii) Almost three will be alive. [6M]
 b) If X is a Poisson variate such that $3P(X = 4) = \frac{1}{2}P(X = 2) + p(X = 0)$, then find (i) The mean (ii) $P(X \leq 2)$ [4 M]
8. Derive mean and variance of Normal distribution. [10 M]
9. Find the mean and variance of a Normal distribution in which 7% of items are under 35 and 89% are under 63. [10 M]
10. In a sample of 1000 cases, the mean of certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal find (i) how many students score between 12 and 15. (ii) How many students score above 18? (iii) How many students score below 18? [10 M]

UNIT –III

1. a) The weights of 6 competitors in a game are given below 58,62,56,63,55,61kgs. Find arithmetic mean of weight of competitors. [2 M]
 b) Find the median of the following values 26, 8, 6, 12, 15, 32. [2 M]
 c) Obtain mode of the values 10,12,15,20,12,16,18,15,12,10,16,20,12,24. [2 M]
 d) Write the formulas for correlation, rank correlation [2 M]
 e) Write the formulas for the lines of regression X on Y and Y on X. [2 M]

2. a) Find arithmetic mean to the following data using step deviation method [5 M]

Marks	10-20	20-30	30-40	40-50	50-60
frequency	5	8	25	22	10

- b) Find the median to the following data [5 M]

x	5	8	11	14	17	20	23
f	2	8	12	20	10	6	3

3. a) Find the median to the following data [5 M]

Class intervals	40-50	50-60	60-70	70-80	80-90
frequency	5	12	23	8	2

- b) Find arithmetic mean to the following data [5 M]

x	1	2	3	4	5
f	5	8	10	12	6

4. a) Find mode to the following data [5 M]

X	0-10	10-20	20-30	30-40	40-50	50-60	60-70
F	4	13	21	44	33	22	7

- b) The first four moments of a distribution about the value 5 of the variables are 2, 20, 40 and 50. Calculate mean, variance, β_1 and β_2 of the distribution. [5 M]

5. Compute Karl Pearson and Bowley's coefficient of Skewness to the following data [10 M]

Class intervals	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
frequency	2	6	11	20	40	75	45	25	18	8

6. Compute the first four central moments to the following data and also find Sheppard's correction, β_1 and β_2 [10 M]

Class intervals	0-10	10-20	20-30	30-40	40-50	50-60	60-70
frequency	2	8	12	40	20	15	3

7. a) Calculate correlation coefficient to the following data [5 M]

X	10	15	12	17	13	16	24	14	22	20
Y	30	42	45	46	33	34	40	35	39	38

b) Obtain the rank correlation coefficient for the following data: [5 M]

X	48	60	72	62	56	40	39	52	30
Y	62	78	65	70	38	54	60	32	31

8. a) Ten competitors in a musical test were ranked by the three judges A,B and C in the following order:

Ranks by A	1	6	5	10	3	2	4	9	7	8
Ranks by B	3	5	8	4	7	10	2	1	6	9
Ranks by C	6	4	9	8	1	2	3	10	5	7

Using rank correlation coefficient method, discuss which pair of judges has the nearest approach to common likings in music. [5 M]

b) If the two lines of regression are $4X-5Y+30=0$ and $20X-9Y-107=0$ which of these is the line of regression of X on Y. Find r and σ_y when $\sigma_x = 3$ [5 M]

9. a) Obtain the rank correlation coefficient for the following data : [5 M]

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

b) Find two regression equations from the following data: [5 M]

X	10	25	34	42	37	35	36	45
Y	56	64	63	58	73	75	82	77

10. a) Calculate the correlation coefficient for the following heights(in inches) of fathers(X) and their sons(Y) [6 M]

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

b) From the following regression equations, calculate \bar{X} , \bar{Y} and r $20X-9Y=107$, $4X-5Y=-33$ [4 M]

UNIT –IV

1.
 - a) Write the formula to find the root of an equation by Regula Falsi method [2M]
 - b) Write Simpson formulae [2M]
 - c) Write the formula to find a cube root of a number by Newton Raphson's method [2M]
 - d) Evaluate $\Delta \tan^{-1} x$ [2M]
 - e) Construct a forward difference table for the function $y = x^3$ for $x = 0, 1, 2, 3, 4, 5$. [2M]
2. Find a positive root of $x^3 - x - 1 = 0$ correct to two decimal places by Bisection method. [10M]
3. Find out the equation $x \log(x)_{10} = 1.2$ using false position method. [10M]
4. Find the root of the equation $xe^x = 2$ using false position method. [10M]
5. Find a real root of the equation $xe^x - \cos x = 0$ using Newton-Raphson method. [10M]
6. Using Newton-Raphson method (i) Find square root of 28 (ii) cube root of 15. [10M]
7. from the following table values of x and $y = \tan x$ interpolate values of y when $x=0.12$ and $x=0.28$ [10M]

x	0.10	0.15	0.20	0.25	0.30
y	0.1003	0.1511	0.2027	0.2553	0.3093

8. a) Using Newton's forward interpolation formula and the given table of values

x	1.1	1.3	1.5	1.7	1.9
$f(x)$	0.21	0.69	1.25	1.89	2.61

Obtain the value of $f(x)$ when $x=1.4$ [5M]

- b) Use Newton's Back ward interpolation formula to find $f(32)$.

Given $f(25) = 0.2707$, $f(30) = 0.3027$, $f(35) = 0.3386$, $f(40) = 0.3794$ [5M]

9. Evaluate $\int_0^1 \frac{1}{1+x} dx$ (i) y trapezoidal rule and Simpson's $\frac{1}{3}$ rule [5M]

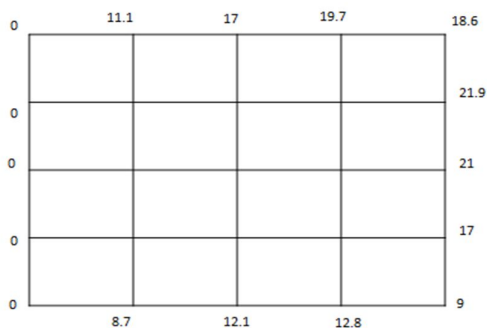
(ii) Using Simpson's $\frac{3}{8}$ rule and compare the result with actual value [5M]

10. a) Compute $\int_0^4 e^x dx$ by Simpson's $\frac{1}{3}$ rule with 10 sub divisions. [5M]

- b) Compute $\int_3^7 x^2 \log x dx$ using trapezoidal rule and Simpson's rule by taking 10 sub divisions. [5M]

UNIT -V

1. a) write R-K method of 4th order formula [2M]
 b) Write the diagonal five-point formula [2M]
 c) write the Taylor's series solution of $y' = -xy$, $y(0)=1$ upto x^4 [2M]
 d) Write the standard five-point formula [2M]
 e) Use Euler's method to find $y(0.1)$ given $y' = (x^3 + xy^2)e^{-x}$, $y(0) = 1$ [2M]
2. a) Tabulate $y(0.1)$, $y(0.2)$, and $y(0.3)$ using Taylor's series method, given that
 $y' = y^2 + x$ and $y(0) = 1$ [5M]
 b) Using Euler's method, find an approximate value of y corresponding to $x = 1$ given that $\frac{dy}{dx} = x + y$
 and $y = 1$ when $x = 0$ [5M]
3. Using Taylor's series method find an approximate value of y at $x = 0.2$ for the D.E $y' - 2y = 3e^x$,
 $y(0) = 0$. Compare the numerical solution obtained with exact solution. [10M]
4. a) Solve $y' = x + y$, given $y(1)=0$ find $y(1.1)$ and $y(1.2)$ by Taylor's series method. [5M]
 b) Solve by the equation $\frac{dy}{dx} = \frac{2y}{x}$, given $y(1) = 2$ and find $y(2) = ?$ [5M]
5. Using R-K method of 4th order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, $y(0)=1$ Find $y(0.2)$ and $y(0.4)$ [10M]
6. Using R-K method of 4th order find $y(0.1), y(0.2)$ and $y(0.3)$ given that $\frac{dy}{dx} = 1 + xy$, $y(0)=2$. [10M]
7. a) Using R-K method of fourth order, compute $y(0.2)$ from $y' = xy$, $y(0)=1$, taking $h=0.2$ [5M]
 b) Using Euler's method $y' = y^2 + x$, $y(0)=1$. Find $y(0.1)$ and $y(0.2)$ [5M]
8. Solve $y'' - x(y')^2 + y^2 = 0$ Using R-K method of 4th order for $x = 0.2$ given $y(0) = 1, y'(0) = 0$.
 Taking $h=0.2$ [10M]
9. Solve the Laplace Equation $u_{xx} + u_{yy} = 0$ given that, [10M]



10) Evaluate the function $u(x, y)$ satisfying $\nabla^2 u = 0$ at the pivotal points given the boundary values as follows:

