

Code: 19BS1401

**II B.Tech - II Semester – Regular Examinations – AUGUST 2021**

**ENGINEERING MATHEMATICS – IV**  
**(Numerical Methods, Probability and Statistics)**  
**(Common to CIVIL, EEE, ME)**

Duration: 3 hours

Max. Marks: 70

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- Note: 1. This question paper contains two Parts A and B.  
 2. Part-A contains 5 short answer questions. Each Question carries 2 Marks.  
 3. Part-B contains 5 essay questions with an internal choice from each unit. Each question carries 12 marks.  
 4. All parts of Question paper must be answered in one place
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**PART – A**

1. a) Prove that  $\Delta = E \nabla$
- b) Explain the Trapezoidal rule.
- c) If X is a Poisson variate such that  $p(X = 1) = p(X = 2)$ . Find the variance of X.
- d) Write about type-I and type-II errors.
- e) Write the properties of t-distribution.

**PART – B****UNIT – I**

2. a) Apply Newton's-Raphson method to find a root of  $x e^x - 2 = 0$ , correct to three decimal places. 6 M
- b) Evaluate the cubic polynomial which takes the following values 6 M

X	0	1	2	3
f(x)	1	2	1	10

Hence or otherwise find the value of  $f(4)$ .

OR

3. a) Find a real root of the equation  $f(x) = x^3 - x - 1 = 0$ , using Bisection method. 6 M
- b) Evaluate the values of 'y' at  $x=0.12$  and  $x=0.26$  from the following table 6 M

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

**UNIT – II**

4. a) Find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  at  $x=0$  and  $x=0.4$  from the following table. 6 M

x	0	0.1	0.2	0.3	0.4
y	1.0000	0.9975	0.9900	0.9776	0.9604

- b) Evaluate  $\int_0^1 \frac{1}{1+x^2} dx$  using Simpson's 1/3 rule by dividing the interval into 10 equal parts. 6 M

OR

5. a) Using the modified Euler's method, find  $y(0.2)$  for given  $\frac{dy}{dx} = x^2 + y^2$ ,  $y(0) = 0$ , correct to four decimal places. 6 M
- b) Given  $\frac{dy}{dx} = 2 + \sqrt{xy}$ ,  $y(1) = 1$ , find  $y(2)$  by applying Runge-Kutta method of order 4 with  $h=0.5$  6 M

**UNIT-III**

6. a) In the following probability distribution 6 M

x	0	1	2	3	4	5	6
p(x)	2k	3k	3k	4k	5k	6k	7k

Find 'k' and mean of the distribution.

- b) The mean height of 500 students is 150 cm and the standard deviation is 15cm. Assuming that they are normally distributed, estimate the number of students having heights that lies between 120 cm and 150 cm. 6 M

OR

7. a) Fit a Binomial distribution for the following data and compare the theoretical frequencies with actual ones. 6 M

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

- b) Assuming that the average life span of computers produced by a certain company is 2040 hours with standard deviation of 60 hours. Find the probability of computers whose life span is 6 M
- (i) more than 2150 hours
  - (ii) less than 1950 hours
  - (iii) more than 1920 hours and less than 2160 hours.

**UNIT – IV**

8. a) An ambulance service claims that it takes an average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has a mean of 11 minutes and the variance of 16 minutes. Test the claim at 0.05 level significance. 6 M

- b) Random samples of 400 men and 600 women were asked whether they would like to have a fly over near their residence. 200 men and 325 women were in favor of the proposal. Test the hypothesis that the proportions of men and women in favor of the proposal are same, at 5 % level. 6 M

OR

9. a) A random sample of 125 cool drinkers, 68 said they prefer Thums Up to Pepsi. Test the null hypothesis  $P=0.5$  against the alternative hypothesis  $P>0.5$ . 6 M

- b) A researcher wants to know the intelligence of students in a school. He selected two groups of students. In the first group there are 150 students having mean IQ of 75 with a standard deviation of 15 in the second group there are 250 students having mean IQ of 70 with standard deviation of 20. Are the two groups drawn from the same population? 6 M

**UNIT – V**

10. a) A random sample of size 25 values from a normal population showed a mean of 1570 and standard deviation 120. Can this sample be regarded as taken from the population having 1600 as mean? 6 M
- b) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins show the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test hypothesis that the true variances are equal. 6 M

OR

11. a) A group of 5 patients treated with medicine A weight 42, 39, 48, 60 and 41 kgs. Second group of 7 patients from the same hospital treated with medicine B weight 38, 42, 56, 64, 68, 69 and 62 kgs. Do you agree with the claim that the medicine B increases the weight significantly. 6 M
- b) The average breaking strength of the steel rods is specified to be 18.5 thousand pounds. To test this, sample of 14 rods were tested. The mean and the standard deviations obtained were 17.85 and 1.955 respectively. Is the result of experiment significant? 6 M