Code No: 132AC **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech I Year II Semester Examinations, February - 2025
MATHEMATICS - III
(Common to CE, EEE, ME, ECE, CSE, IT, MCT, MMT, AE)

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

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a) If it rains, a dealer in rain coats earns Rs. 500/- per day and if it is fair, he loses Rs.50/- per day. If the probability of a rainy day is 0.4. Find his average daily income? [2]

b) Two coins are tossed simultaneously. Find the probability of getting at least seven heads? [3]

c) A mining company needs to estimate the average amount of copper are per ton mined. A random sample of 50 tons gives a sample mean of 146.75 pounds. The population standard deviation is assumed to be 35.2 pounds. Give a 95% confidence interval for the average amount of copper in the "population" of tons mined. [2]

d) A pathologist wants to estimate the mean time required to complete a certain analysis on the basis of sample study so that he may be 99% confident that the mean time may remain with ± 2 days of the mean. As per the available records, the population variance is 5 days^2. What must be the size of the sample for this study? [3]

e) Explain Type I and II Errors? [2]

f) A die is thrown 9000 times and throw of 3 or 4 is observed 3240 times. Show that the die cannot be regarded as an unbiased one and find the limits between which the probability of a throw of 3 or 4 lies. [3]

g) Find the approximate value of $\sqrt{28}$ correct to 3 decimal places using Newton Raphson Method. [2]

h) Find the root of the equation $x^3 + x - 1 = 0$ using Regula-Falsi Method. [3]

i) Write the comparison of Trapezoidal rule and Simpson's 1/3 rule? [2]

j) Using Picard's process of successive approximations, obtain a solution upto the fifth approximation of the equation $\frac{dy}{dx} = y + x$. [3]

PART - B

(50 Marks)

2.a) If the probability of a defective bolt is 0.1, find (i) the mean and (ii) the standard deviation for the distribution of defective bolts in a total of 400?

b) The following data due to Weldon shows the results of throwing 12 dice 4096 times, a throw of 4, 5 or 6 being called success (x).

X	0	1	2	3	4	5	6	7	8	9	10	11	12
V	0	7	60	198	430	731	948	847	536	257	71	11	0

Fit a Binomial distribution and calculate the expected frequency? [5+5]

OR

3.a) If the masses of 300 students are normally distributed with mean 68.0 kg and standard deviation 3.0 kg, how many students have masses:
(i) 72 kgs (ii) ≤ 64 kgs

b) A light bulb manufacturing factory finds 3 in every 60 light bulbs defective. Calculate what will be the probability that the first defective light bulb with be found when the 6^{th} one is tested? [5+5]

4. The average height of the students of science group in a college is 65 inches with a standard deviation of 2.2 inches. If a sample of 40 students is selected at random, what is the probability that the average height of these 40 students lies between 64 and 65.5 inches? [10]

OR

5. In regard to wine tasting competitions, many experts claim that the first glass of wine served sets a reference taste and that a different reference wine may alter the relative ranking of the other wines in competition. To test this claim, three wines, A, B and C, were served at a wine tasting event. Each person was served a single glass of each wine, but in different orders for different guests. At the close, each person was asked to name the best of the three. One hundred seventy-two people were at the event and their top picks are given in the table provided. Test, at the 1% level of significance, whether there is sufficient evidence in the data to support the claim that wine experts' preference is dependent on the first served wine. [10]

		Top Pick		
		A	B	C
First Glass	A	12	31	27
	B	15	40	21
	C	10	9	7

6.a) Before an increase in excise duty on tea, 800 persons out of a sample of 1000 persons were found to be tea drinkers. After an increase in duty, 800 people were tea drinkers in a sample of 1200 people. State whether there is a significant decrease in the consumption of tea after the increase in excise duty?

b) A simple sample of heights of 6400 Englishmen has a mean of 170 cm and S.D of 6.4 cm, while a simple sample of heights of 1600 Americans has mean of 172 cm and S.D of 6.3 cm. Do the data indicate that Americans are on the average taller than Englishmen's? [5+5]

OR

7. The following are the number of mistakes made in 5 successive days by 4 technicians working for a photographic laboratory. Test whether the difference among the four sample means can be attributed to chance. [Test at a level of significance α=0.01]. [10]

I	II	III	IV
6	14	10	9
14	9	12	12
10	12	7	8
8	10	15	10
11	14	11	11

8. Solve the equations by Gauss Jacobi and Gauss Seidel Methods. [10]

$$8x - 3y + 2z = 20; 4x + 11y - z = 33; 6x + 3y + 12z = 35.$$

OR

9. The temperature (T) (in °C) and length (L) (in mm) of a heated rod are given below. If $L = a_0 + a_1 T$. Find the best values of a_0 and a_1. [10]

T	20	30	40	50	60	70
L	800.3	800.4	800.6	800.7	800.9	801.0

10. Evaluate $\int_4^{5.2} logx dx$ by using trapezoidal, Simpson's 1/3, Simpsons 3/8 rules from [10]

x	4	4.2	4.4	4.6	4.8	5	5.2
logx	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

OR

11. Using the Runge-Kutta method of fourth order, solve for y at x = 0.2, 0.4 from $\frac{dy}{dx} = \frac{y-x}{y+x}$ given $x_0 = 0, y_0 = 1, h = 0.2$. [10]

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