Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (New) EXAMINATION – WINTER 2015

Subject Code:2140606 **Date:19/12/2015**

Subject Name: Numerical and Statistical Methods for Civil Engineering

Time: 02:30pm to 05:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** (i) Two students x and y work independently on a problem. The probability that x will solve it is 3/4 and the probability that y will solve it is 2/3. What is the probability that problem will be solved? **02**

(ii) Evaluate the integral $\int_{-1}^{1} \frac{dx}{1+x^2}$ by Gaussian integration two point formula. **02**

(iii) Using Taylor's series method, find y(1.1) correct to four decimal places, given that $\frac{dy}{dx} = xy^{1/3}$, y(1) = 1. **03**

(b) (i) Obtain the binomial distribution for which mean is 10 and variance is 5. **02**

(ii) With the usual notation show that $\Delta = e^{hD} - 1$. **02**

(iii) Find the $\sqrt{10}$ correct to three decimal places by using Newton-Raphson iterative method. **03**

Q.2 **(a)** A book contains 100 misprints distributed randomly throughout its 100 pages. What is the probability that a page observed at random contains at least two misprints. Assume Poisson Distribution. **07**

(b) State Bayes's theorem. In a bolt factory, three machines A, B and C manufacture 25%, 35% and 40% of the total product respectively. Of these outputs 5%, 4% and 2% respectively, are defective bolts. A bolt is picked up at random and found to be defective. What are the probabilities that it was manufactured by machines A, B and C? **07**

OR

(b) What are the properties of Binomial Distribution? The average percentage of failure in a certain examination is 40. What is the probability that out of a group of 6 candidates, at least 4 passed in examination? **07**

Q.3 **(a)** Calculate the Mean, Median and Mode for the following data: **07**

Class interval	50-53	53-56	56-59	59-62	62-65	65-68
Frequency	3	8	14	30	36	28
Class interval	68-71	71-74	74-77			
Frequency	16	10	5			

(b) Calculate the coefficient of correlation and obtain the lines of regression for the following: **07**

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

OR

Q.3 **(a)** From the following regression equations **07**

$8x-10y = -66$, $40x - 18y = 214$ and variance of $x = 9$

Find (i) Average values of x and y.

(ii) Correlation Coefficient between the two variables.

(iii) Standard Deviation of y.

(b) Fit a second degree parabola $y = ax^2 + bx + c$ in least square sense for the following data: **07**

x	1	2	3	4	5
y	10	12	13	16	19

Q.4 **(a)** Explain False position method for finding the root of the equation $f(x) = 0$.Use this method to find the root of an equation $x = e^{-x}$ correct to up to three decimal places. **07**

(b) Explain Euler's method for solving first order ordinary differential equation. Hence use this method, find y (2) for $\frac{dy}{dx} = x + 2y$ with $y(1) = 1$. **07**

OR

Q.4 **(a)** Determine the interpolating polynomial of degree three by using Lagrange's interpolation for the following data. Also find f(2) **07**

x	-1	0	1	3
f(x)	2	1	0	-1

(b) Explain Bisection method for solving an equation $f(x) = 0$. Find the real root of equation $x^2 - 4x - 10 = 0$ by using this method correct to three decimal places **07**

Q.5 **(a)** Apply Runge - kutta fourth order method to calculate y(0.2) and y(0.4) given **07**

$\frac{dy}{dx} = y - \frac{2x}{y}$, $y(0) = 1$.

(b) Solve the following system of equations by Gauss elimination method with partial pivoting. **07**

$2x_1 + 2x_2 + x_3 = 6$, $4x_1 + 2x_2 + 3x_3 = 4$, $x_1 + x_2 + x_3 = 0$

OR

Q.5 **(a)** Compute values of f(0.12) and f(0.40) using suitable interpolation formula for the following data: **07**

x	0.10	0.15	0.20	0.25	0.30
f(x)	0.1003	0.1511	0.2027	0.2553	0.3093

(b) Derive Trapezoidal rule and Evaluate $\int_{0.5}^{1.3} e^{x^2}\,dx$ by using Simpson's 1/3rd rule. **07**

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