

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-IV (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2140606

Date:17/05/2018

Subject Name:Numerical and Statistical Methods for Civil Engineering

Time:10:30 AM to 01:00 PM

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) In usual notations, prove (1) $E = 1 + \Delta$ (2) $\nabla = 1 - E^{-1}$ (3) $(1 + \Delta)(1 - \nabla) = 1$ **03**

(b) Given $\frac{dy}{dx} = x + y$ with $y(0) = 1$, using Euler's method find $y(0.1)$, $y(0.2)$. **04**

(c) Apply Gauss Elimination method to solve system of linear equations: **07**
 $2x + 6y + z = 7$; $x + 2y - z = -1$; $5x + 7y - 4z = 9$

Q.2 (a) Evaluate $\int_2^6 \log_{10} x \, dx$ using trapezoidal rule. Take $h = 1$ **03**

(b) Weights of 500 students of a college are normally distributed with average weight 95 lbs and standard deviation 7.5. find how many students have the weight between 100 and 110 lbs. **04**

$$(P(X \leq 2) = 0.9772, P(X \leq 0) = 0.5, P(X \leq 0.67) = 0.7486)$$

(c) Apply Gauss Jacobi method to solve system of linear equations: **07**
 $15x + 3y - 2z = 85$; $2x + 10y + z = 51$; $x - 2y + 8z = 5$

OR

(c) Write formula for binomial distribution when n and p is known. If $n = 4$ and $p = 0.2$, then prepare binomial distribution for the random variable X . Also, find $E(X)$, $V(X)$, $E(3X + 7)$ and $V(3X + 7)$ **07**

Q.3 (a) Find one root of $e^x - 3x = 0$ correct up to two decimal places using Bisection method. Use 1.5 and 1.52 as initials. **03**

(b) Use 2nd order Runge – Kutta method to find $y(1.1)$ provided $\frac{dy}{dx} = x^2 + y^2$ with $y(1) = 1$ **04**

(c) Find cube root of 72 using Newton Raphson method correct up to four decimal places. **07**

OR

Q.3 (a) Approximate value of y at $x = 0.4$ using Milne's method provided $\frac{dy}{dx} = \frac{y}{2}$, **03**

$$y(0) = 1, y(0.1) = 1.05, y(0.2) = 1.1025 \text{ and } y(0.3) = 1.1576$$

(b) Find a real root of $\cos x - 3x + 5 = 0$ correct four decimal places using False Position method. **04**

(c) Use Taylor's Series method to solve the equation $\frac{dy}{dx} = 3x + y^2$ to approximate y when $x = 0.1$ given that $y(0) = 1$ **07**

Q.4 (a) Use Lagrange’s interpolation formula to find $y(2)$ from the data given below: **03**

X	0	1	3	4
Y	1	2	10	17

(b) Evaluate $\int_0^3 \frac{1}{1+x} dx$ using Simpson’s 3/8 rule. Take $h = 0.5$. **04**

(c) Use an appropriate interpolation formula to evaluate $y(9)$ and $y(29)$ for the data given below: **07**

x	5	10	15	20	25	30
y	22	44	66	88	110	132

OR

Q.4 (a) Determine the missing entry in the following table. **03**

X	0	1	2	3	4
Y	1	4	17	?	97

(b) Evaluate $\int_0^1 \exp(-x^2) dx$ using three point Gaussian Integration formula. **04**

(c) A diagnostic test has a probability of 0.95 of giving a positive result when applied to a person suffering from a certain disease, and a probability 0.10 of giving a (false) positive when applied to a non – sufferer. It is estimated that 0.5% of the population are sufferers. Suppose that the test is now administered to a person about whom we have no relevant information relating to the disease (apart from the fact that he/she comes from this population). Calculate the following probabilities: **07**

- (a) That the test result will be positive;
- (b) That, given a positive result, the person is a sufferer;
- (c) That, given a negative result, the person is a non – sufferer;
- (d) That the person will be misclassified.

Q.5 (a) Find Arithmetic mean and standard deviation for the data given below: **03**

2, 2, 5, 7, 9, 12, 13, 14, 16, 20

(b) Fit a second degree polynomial to the data, (1,3), (2,7), (3,13), (4,21), (5,31). **04**

(c) Calculate mode for the following data: **07**

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	5	15	20	20	32	14	14

OR

Q.5 (a) In a box, 100 bulbs are supplied out of which 10 bulbs have defects of type A, 5 bulbs have defects of type B and 2 have defects of both types. Find the probabilities that a bulb to be drawn at random has a B type defect under the condition that it has an A type defect. **03**

(b) Three coins are tossed to gather and let random variable x be the number of heads in each outcome. Then find (a) Probability distribution, (b) Mean and (c) standard deviation **04**

(c) From the following data obtain the two regression lines and the coefficient of correlation. **07**

X	100	98	78	85	110	93	80
Y	85	90	70	72	95	81	74
