GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV (New) EXAMINATION – WINTER 2019

Subject Code: 2140606   **Date: 07/12/2019**

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.**

                                                                                          MARKS

Q.1 **(a)** Two dice are tossed. Find the probability of getting an even number on the first die or a total of 8.   **03**

(b) Find a real root of the equation $x = e^{-x}$, using the Newton's Raphson method correct to three decimal places.   **04**

(c) Use Gauss elimination method to solve the following equations :   **07**
$$x + 4y - z = -5$$
$$x + y - 6z = -12$$
$$3x - y - z = 4$$

Q.2 **(a)** Prove that $\Delta = E\nabla = \nabla E$, where notations Δ, ∇ and E are standard operators.   **03**

(b) Use Lagrange's formula find a polynomial of degree three which fits into the data below: **04**

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

(c) From the following table, find the value of $e^{1.17}$ using Gauss forward formula: **07**

X :	1.00	1.05	1.10	1.15	1.20	1.25	1.30
e^x:	2.7183	2.8577	3.004	3.1582	3.3201	3.4903	3.6693

OR

(c) Compute Y(1.5) and $Y'(1)$, using Cubic Splines from the following data   **07**

X:	1	2	3
Y:	-8	-1	18

Q.3 **(a)** In a book of 520 pages, 390 typo-graphical errors occur. Assuming Poisson law for the number of errors per page, find the probability that a random sample of 5 pages will contain no error.   **03**

(b) An unbiased coin is tossed 6 times. Find the probability of getting (i) exactly 4 heads (ii) at least 4 heads.   **04**

(c) Ten competitors in a musical test were ranked ranked by the three judges A, B and C in the following order. Decide the decision of judges common to near approach.:   **07**

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

OR

Q.3 **(a)** Find a root of the equation $x^3 - 4x - 9 = 0$ using the Bisection method in four stages.   **03**

(b) Find the root of the equation $\cos x = xe^x$ using secant method correct to four decimal places. **04**

(c) Fit a second degree polynomial using least square method to the following data: **07**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

Q.4 (a) Using Newton's forward interpolation formula, find the value of f(1.6), **03**

x	1	1.4	1.8	2.2
f(x)	3.49	4.82	5.96	6.5

(b) Find the third divided difference with arguments 2,4,9,10 of the function $f(x) = x^3 - 2x$. **04**

(c) Solve the following system by Gauss Jacobi method. **07**
$$27x + 6y - z = 85$$
$$6x + 5y + 2z = 72$$
$$x + y + 54z = 110$$

OR

Q.4 (a) Define discrete and continuous random Variables with example. **03**

(b) Using Taylor series method, find $y(1.1)$ correct to four decimal places, given that $\frac{dy}{dx} = xy^{\frac{1}{3}}, \; y(1) = 1$. **04**

(c) From the following data calculate two equations of line of regression. **07**

	X	Y
Mean	60	67.5
Standard deviation	15	13.5

Correlation coefficients between X and Y is 0.50. Also estimate the value of Y for X=72 using the appropriate regression equation.

Q.5 (a) Evaluate $\int_0^1 e^x \, dx$, with n=10 using the trapezoidal rule. **03**

(b) Using Simpson's 1/3 rule, find $\int_0^{0.6} e^{-x^2} \, dx$ by taking n=6. **04**

(c) A train is moving at the speed of 30 m/sec. suddenly brakes are applied. The speed of the train per second after t seconds is given by the following table. **07**

Time (t)	0	5	10	15	20	25	30
Speed (v)	30	24	19	16	13	11	10

Apply Simpson's three eight rule to determine the distance moved by the train in 30 seconds.

OR

Q.5 (a) Fit the best straight line to the data: **03**

x	-1	0	1	2
y	1	0	1	4

(b) Using Eulers method, find $y(0.2)$ given $\frac{dy}{dx} = y - \frac{2x}{y}, y(0) = 1$ with h=0.1. **04**

(c) Use the second order Runge Kutta method to find an approximate value of y given that $\frac{dy}{dx} = x - y^2$ and $y(0) = 1$ at $x = 0.2$ taking $h = 0.1$. **07**

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