

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-IV (NEW) EXAMINATION – WINTER 2017

Subject Code: 2140606

Date: 09/11/2017

Subject Name: Numerical and Statistical Methods for Civil Engineering

Time: 02:30 PM TO 05:00 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) Prove that $(1 + \Delta)(1 - \nabla) = 1$ **03**
- (b) Using Newton's forward formula, find the value of $f(1.6)$ if **04**
- | | | | | |
|--------|------|------|------|-----|
| x | 1 | 1.4 | 1.8 | 2.2 |
| $f(x)$ | 3.49 | 4.82 | 5.96 | 6.5 |
- (c) Use the power method to find the largest eigen value and corresponding **07**
eigen vector of the matrix $A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$
- Q.2**
- (a) Evaluate the integral $\int_0^4 e^x dx$ by Simpson's 1/3 rule (take $h = 1$) **03**
- (b) Find the root of $\cos x - xe^x = 0$ using bisection method correct to three **04**
decimal places
- (c) Use second order Runge-Kutta method to solve $\frac{dy}{dx} = 3x + y$, given **07**
 $y=1.3$ when $x=1$ to approximate y when $x=1.2$ taking $h=0.1$
- OR**
- (c) If P is the pull required to lift a load W by means of a pulley block, find **07**
a linear law of the form $P = mW + c$ connecting P and W using the
following data:
- | | | | | |
|-----|----|----|-----|-----|
| P | 12 | 15 | 21 | 25 |
| W | 50 | 70 | 100 | 120 |
- Where P and W are taken in $kg\text{-wt.}$ Compute P when $W=150kg$
- Q.3**
- (a) Find the average wages for the construction of the building from the **03**
wages paid to different workers
- | | | | | | |
|----------------|-----|-----|-----|-----|-----|
| Wages | 100 | 200 | 300 | 400 | 500 |
| No. of Workers | 3 | 5 | 6 | 9 | 2 |
- (b) Find standard deviation for the distribution giving 300 cars according to **04**
their selling days:
- | | | | | | | | |
|-------------|------|-------|-------|--------|---------|---------|---------|
| No. of days | 0-30 | 30-60 | 60-90 | 90-120 | 120-150 | 150-180 | 180-210 |
| No. of cars | 9 | 17 | 43 | 82 | 81 | 44 | 24 |
- (c) A company has two plants to manufacture hydraulic machines. At plant **07**

I manufactures 70% of the hydraulic machines and at plant II manufactures 30%. At plant I, 80% of hydraulic machines are rated standard quality and at plant II, 90% of hydraulic machines are rated standard quality. A machine is picked up at random and is found to be of standard quality. What is the chance that it has come from plant I?

OR

Q.3 (a) Find the median of the following data: **03**

Marks	<20	21-30	31-40	41-50	51-60	61-70
No. of students	5	15	20	6	6	8

(b) Find the first four moments about mean for $x = 5, 10, 8, 13, 4$ **04**

(c) Find the coefficient of correlation of price and demand of the commodity: **07**

Price(Rs)	60	65	70	75	80	85	90	95	100
Demand(qty)	35	30	25	25	23	21	20	20	18

Q.4 (a) For the probability function $f(x) = \frac{k}{1+x^2}, -\infty < x < \infty$, find k **03**

(b) Use the method of false-position to find the real root of $x^3 - 4x - 9 = 0$ correct to three decimal places **04**

(c) Obtain the values of $f(8)$ and $f(15)$ from the following data using Newton's divided difference formula: **07**

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

OR

Q.4 (a) If 3 of 12 car drivers do not carry driving license, what is the probability that a traffic inspector who randomly checks 3 car drivers, will catch 1 for not carrying driving license (use binomial dist.) **03**

(b) Find a real root of $xe^x = 2$, correct to three decimal places, by using Newton-Raphson method **04**

(c) By Gauss-Seidel method solve: **07**
 $6x + 15y + 2z = 72, x + y + 54z = 110, 27x + 6y - z = 85$, using diagonally dominant matrix form.

Q.5 (a) The probability that a person catch swine flu virus is 0.001. find the probability that out of 3000 persons (i) exactly 3, (ii) more than 2 persons will catch the virus. ($F(2; \lambda) = 0.42$) **03**

(b) A room has three lamp sockets. From a collection of 10 light bulbs of which only 6 are good. A person selects 3 at random and puts them in the socket. What is the probability that the room will have light? **04**

(c) Obtain the two regression lines from the following data: **07**

x	6	2	10	4	8
y	9	11	5	8	7

OR

Q.5 (a) A random variable having the normal distribution with $\mu = 18.2$ and $\sigma = 1.25$, find the probabilities that it will take on a value (i) less than 16.5 (ii) between 16.5 and 18.8 **03**
($F(0.48) = 0.3156, F(-1.36) = 0.0869$)

(b) Find the mode for the distribution of total runs scored by 100 players in **04**

the tournament:

Runs	0-50	50-100	100-150	150-200	200-250	250-300
No. of players	10	5	25	30	10	20

(c) For the following probability distribution

07

x	1	2	3	4	5
f(x)	0.1	0.1	0.2	0.3	0.3

- (i) Find the mean and variance
- (ii) Find the distribution function
