

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER- IV EXAMINATION – SUMMER 2020

Subject Code: 2141703

Date: 26/10/2020

Subject Name: NUMERICAL TECHNIQUES & STATISTICAL METHODS

Time: 10:30 AM TO 01:30 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) Using usual notations show that $(E^{1/2} + E^{-1/2})(1 + \Delta)^{1/2} = 2 + \Delta$. **03**
 (b) Explain different types of errors in Numerical computation. **04**
 (c) Evaluate $\int_0^{0.5} \frac{x}{\sin x} dx$ using Romberg's method, correct to 3 decimal places. **07**

- Q.2** (a) Explain Bisection method to solve the algebraic equation. **03**
 (b) A random variable x has the following probability distribution: **04**

x_i	0	1	2	3
p_i	1/6	3/8	3/8	1/8

Find the standard deviation of x for the given distribution.

- (c) If $f(100) = 10.63$, $f(150) = 13.03$, $f(200) = 15.04$, $f(250) = 16.81$, $f(300) = 18.42$, $f(350) = 19.90$ and $f(400) = 21.27$, find the value of $f(218)$. **07**

OR

- (c) Evaluate $f(9)$ using Lagrange's interpolation formula for the below given values: **07**

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

- Q.3** (a) State Trapezoidal rule, Simpson's $1/3^{\text{rd}}$ rule and Simpson $3/8^{\text{th}}$ rule. **03**
 (b) Solve, by Gauss Jacobi iteration method, the equations **04**
 $20x + y - 2z = 17$; $3x + 20y - z = -18$; $2x - 3y + 20z = 25$.
 (c) Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2$. **07**

OR

- Q.3** (a) Evaluate $\int_0^1 e^{-x^2} dx$ using Gauss quadrature formula of three points. **03**
 (b) Solve, by Gauss Seidel iteration method, the equations **04**
 $2x + y + 6z = 9$; $8x + 3y + 2z = 13$; $x + 5y + z = 7$.
 (c) Solve the boundary-value problem $\frac{d^2y}{dx^2} - y = 0$ with $y(0) = 0$ and $y(2) = 3.62686$ by finite difference method. **07**

- Q.4** (a) Calculate the median for the following data: **03**

Class Interval	0-30	30-60	60-90	90-120	120-150	150-180
Frequency	8	13	22	27	18	7

- (b) A die is thrown six times. If getting an odd number is a success, find the probability of (i) at least five success and (ii) at most five success. **04**
 (c) Represent the following information in form of a network. Find average duration time or expected time of each activity and obtain the critical path. **07**

Activity	1-2	2-3	3-4	4-4	4-5	4-6	5-7	5-8	7-9	8-9	9-10	6-10
Optimistic time	4	1	8	3	2	3	3	4	4	2	4	4
Most Likely time	9	5	10	6	4	7	7	8	9	6	11	7
Pessimistic time	14	18	17	8	5	10	10	9	14	10	18	9

OR

Q.4 (a) Calculate the mode for the following data: **03**

Class Interval	0-10	10-20	20-30	30-40	40-50
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(b) A book contains 100 misprints distributed randomly throughout its 100 pages. What is the probability that a page observed at random contains at least 2 misprints. **04**

(c) Draw PERT – diagram after finding out expected time & find critical path. **07**

Activity	Sequence	Optimistic Time	Most Likely Time	Pessimistic Time
A	1-2	7	12	13
B	1-3	7	10	12
C	2-5	8	13	15
D	3-5	10	12	22
E	5-6	10	14	18

Q.5 (a) A card is drawn at random from a pack of 52 cards. What is the probability that the card is a spade or a king? **03**

(b) A tire company is suspicious to claim that the average lifetime of certain tires is at least 28000 km. To check the claim, the company takes the sample of 40 tires and gets a mean life time of 27463 km with standard deviation of 1348 km. Test the hypothesis at 1% level of significance. **04**

(c) Fit a Poisson distribution for the following data and test the goodness of fit. **07**

x	0	1	2	3	4
f	112	73	30	4	1

OR

Q.5 (a) Define a term random variable and explain different types of random variable. **03**

(b) The mean of 35 sample of the thermal conductivity of a certain kind of cement brick is 0.343 with standard deviation of 0.010. Test the hypothesis that the population mean is 0.340 at 5% level of significance. **04**

(c) Fit a binomial distribution for the following data showing the survey of 800 families with 4 children and test the goodness of fit. **07**

No. of boys	0	1	2	3	4
No. of girls	4	3	2	1	0
No. of families	32	178	290	238	64
