Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 2141703 **Date: 30/05/2017**

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) Choose the appropriate answer for the following MCQs

1 Putting $n = 1$ in the Newton-cote's quadrature formula following rule is obtained **1**

(a) Simpson's rule (b) Trapezoidal rule (c) Simpson's 3/8 rule (d) none of these.

2 $\Delta\nabla$ equal to **1**

(a) $\Delta + \nabla$ (b) $\nabla - \Delta$ (c) $\nabla\Delta$ (d) None of these.

3 E equal to **1**

(a) $1 + \Delta$ (b) $\Delta\nabla$ (c) $\Delta + \nabla$ (d) $\nabla - \Delta$

4 The auxiliary quantity k_1 obtained by Runge-kutta fourth order for the differential equation $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$ when $h = 0.1$ is **1**

(a) 0.1 (b) 0 (c) 1 (d) None of these

5 As soon as a new value of a variable is found by iteration , it is used immediately in the following equation , this method is known as **1**

(a) Gauss Jordan method (b) Gauss Seidal method

(c) Gauss elimination method (d) Gauss Jacobi Method

6 Find $y(0.1)$ by Euler's method, given $\frac{dy}{dx} = y - \frac{2x}{y}, y(0) = 1$ with $h = 0.1$. **1**

(a) 1.01 (b) 1.001 (c) 1.1 (d) 0.11

7 While evaluating a definite integral by Trapezoidal rule , the accuracy can be increased by taking **1**

(a) large number of sub intervals (b) small number of sub intervals

(c) odd number of sub intervals (d) none of these.

8 Let X be a Poisson random variable, such that $2P(X = 0) = P(X = 2)$ Then standard deviation is **1**

(a) 4 (b) 2 (c) $-\sqrt{2}$ (d) $\sqrt{2}$.

9 The Standard deviation of Binomial distribution is: **1**

(a) npq (b) $\sqrt{npq}$ (c) $n^2p^2q^2$ (d) np

10 The χ^2 test is defined as **1**

(a) $\chi^2 = \sum_{i=1}^{n} \frac{O_i - E_i}{E_i}$ (b) $\chi^2 = \sum_{i=1}^{n} \frac{O_i + E_i}{E_i}$

(c) $\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$ (d) $\chi^2 = \sum_{i=1}^{n} \frac{(O_i + E_i)^2}{E_i}$

11 The activity that can be delayed without affecting the execution of the immediate succeeding activity is determined by **1**
(a) total float (b) free float (c) independent float
(d) none of these

12 The Critical path satisfy the condition that **1**
(a) $E_i = L_i$ & $E_j = L_j$ (b) $L_i - E_i = L_i - L_j$
(c) $L_j - E_i = L_i - E_j = d$ (constant) (d) all of the above

13 One of the methods of determining mode is **1**
(a) mode = 2 median - 3 mean (b) mode = 2 median + 3 mean
(c) mode = 3 median + 2 mean (d) mode = 3median - 2 mean

14 The probability that a leap year contain 53 Sundays: **1**
(a) 0 (b) 1/7 (c) 2/7 (d) 1

Q.2 **(a)** From the following data compute the value of harmonic mean **03**

Class	10-20	20-30	30-40	40-50	50-60
Frequency	4	6	10	7	3

(b) Evaluate $\int_0^1 \int_0^1 e^{x+y}\, dxdy$, using trapezoidal rule with $h = k = 0.5$. **04**

(c) Solve the following system of equation by using Gauss Seidal method correct up to four decimal points. **07**

$10x + y + z = 12$

$2x + 10y + z = 13$

$2x + 2y + 10z = 14$

OR

(c) Use power method to find the largest eigan value of the matrix $A = \begin{bmatrix} 3 & -5 \\ -2 & 4 \end{bmatrix}$. **07**

Q.3 **(a)** Evaluate $\int_0^3 \frac{dx}{1+x}$ with $n = 6$ by using simpson's 3/8 rule. **03**

(b) Given $\frac{dy}{dx} = y - x$ where $y(0) = 2$ find $y(0.1)$ & $y(0.2)$ correct to four decimal places, by using Runge-kutta method of fourth order. **04**

(c) Using Newton's divide-difference interpolation find f(1) & f(9) from the following table: **07**

x	-1	0	2	5	10
y	-2	-1	7	124	999

OR

Q.3 **(a)** Using Taylor's series method to solve $\frac{dy}{dx} = 1 + y^2$ with initial condition $x_0 = 0, y_0 = 0$ .Find approximate value of y for $x = 0.2$. **03**

(b) Compute f(2) by using Lagrange's interpolation method from the following data: **04**

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

(c) Find $y(0.4)$ if it given that $\frac{dy}{dx} = 1 + xy^2$ & $y(0) = 1, y(0.1) = 1.105$, . $y(0.2) = 1.223$, $y(0.3) = 1.354$ .Using Milen's predictor & corrector method. **07**

Q.4 (a) The average monthly sales of 5000 firms are normally distributed. Its mean and standard deviation are Rs. 36000 and Rs. 10000 respectively. Find the number of firms the sales of which are over Rs 40000.Relevant extract at the area (under the normal curve) 0.1554 for z = 0.40. **03**

(b) A set of 5 coins is tossed 3,200 times, and the number of heads appearing each time is noted. The results are given below: **04**

No of heads	0	1	2	3	4	5
Frequency	80	570	1100	900	500	50

Test the hypothesis that the coins are unbiased. For($v = 5, \chi_{0.05}^2 = 11.07$)

(c) The odds against A speaking the truth are 4:6 while the odds in favor of B speaking the truth are 7:3. **07**

(1) What is the probability that A and B contradict each other in stating the same fact?

(2) If A and B agree on a statement, what is the probability that this statement is true.

OR

Q.4 (a) In an examination 30% students have failed in mathematics, 20% of the students have failed in chemistry and 10% have failed in both mathematics and chemistry. A student is selected at radom. What is the probability that (i) the student has failed in mathematics if it is known that he has failed in chemistry. (ii) What is the probability that the student has failed either in mathematics or chemistry? **03**

(b) 100 electric bulbs are found to be defective in a lot of 5000 bulbs. Find the probability that at the most 3 bulbs are defective in a box of 100 bulbs [$e^{-2} = 0.1353$]. **04**

(c) Out of 800 families with 4 children each, what percentage would be expected to have (a) 2 boys and 2 girls, (b) at least one boy, (c) no girls and (d) at the most 2 girls. Assume equal probabilities for boys and girls. **07**

Q.5 (a) A person throws 10 dices 500 times and obtains 2560 times 4, 5, or 6. Can this be attributed to fluctuation of sampling? **03**

(b) The life time of electric bulbs for a random sample of 10 from large consignment gave the following data: **04**

Item	1	2	3	4	5	6	7	8	9	10
Life in '000 hours	4.2	4.6	3.9	4.1	5.2	3.8	3.9	4.3	4.4	5.6

Can we accept the hypothesis that the average life time of blubs is 4,000 hours?(for $v = 9, t_{0.05} = 2.262$)

(c) The following table gives data on normal time, and cost and crash time and cost for a project. **07**

Activity	Normal		Crash	
	Time(Weeks)	Cost (Rs)	Time(weeks)	Cost(Rs)
1-2	3	300	2	400
2-3	3	30	3	30

2-4	7	420	5	580
2-5	9	720	7	810
3-5	5	250	4	300
4-5	0	0	0	0
5-6	6	320	4	410
6-7	4	400	3	470
6-8	13	780	10	900
7-8	10	1000	9	1200

Indirect cost is Rs. 50 per week.

(a) Draw the network diagram for the project and identify the critical path.

(b) What are the normal project duration and associated cost?

(c) Find out the total float associated with each activity.

OR

Q.5 **(a)** In a hospital 480 female and 520 male babies were born in a week. Do these figures confirm the hypothesis that males and females are born in equal number? **03**

(b) Two types of drugs were used on 5 and 7 patients for reducing their weight. Drug A was imported and drug B indigenous. The decrease in the weight after using the drugs for six months was as follows: **04**

DrugA	10	12	13	11	14		
Drug B	8	9	12	14	15	10	9

Is there a significant difference in the efficacy of the two drugs? If not, Which drug should you buy?(for $v = 10, t_{0.05} = 2.223$)

(c) The time estimates (in weeks) for the activities of a PERT network are given below. **07**

Activity	t_0	t_m	t_p
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

(a) Draw the project network and identify all the paths through it.

(b) Determine the expected project length.

(c) Calculate the standard deviation and variance of the project length.

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