GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2015

Subject Code:2141703   **Date:26/05/2015**

Subject Name: NUMERICAL TECHNIQUES & STATISTICAL
                          METHODS

Time:10:30am-1.30pm   **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)**   **07**
   1. If x=3.4327, find the values of absolute & relative errors if: **[2]**
          (a) x is truncated to 3 decimal places.
          (b) x is rounded off to 3 decimal places.

   2. Show that: (i) $\Delta = E-1$ & (ii) $\nabla = 1-E^{-1}$ **[2]**

   3. Consider the following distribution: **[3]**

x	0-10	10-20	20-30	30-40	40-50
f	12	18	20	25	23

Compute Mean, Median & Mode.

(B)   **07**
   1. Given the equation $\frac{dy}{dx} = 3x^2 + 1$.with y(1) =2.Estimate y(2) by using Euler's **[2]**
          Method using h=0.25.

   2. Given P(A)=$\frac{1}{4}$, P(B)=$\frac{1}{3}$ & P(A∪B)=$\frac{1}{2}$. Evaluate $P(A/B), P(B/A)$, $P(A \cap B')$ & $P(\frac{A}{B'})$.   **[2]**

   3. A coin was tossed 400 times & the head turned up 216 times. Test the   **[3]**
          hypothesis that the coin is unbiased.

Q.2 **(A)** Write the Trapezoidal rule for numerical Integration. Using the Simpson's $\frac{1}{3}$ **07**
          Rule, $\int_{1}^{2.8} f(x)dx$ evaluate from the following data.

x	1	1.3	1.6	1.9	2.2	2.5	2.8
f(x)	1	1.69	2.56	3.61	4.84	6.25	7.84

(B) Find the positive root of $x^3 = 2x + 5$ by False Position method.   **07**
                                          OR
(B) Solve the following system of equations by using Gauss Seidel method correct   **07**
          up to 4 decimal places.
                  8x-3y+2z=20
                  4x+11y-z=33
                  6x+3y+12z=35

Q.3 **(A)** Find f(3) & f´(3)from the following table using Lagrange's Interpolation. **07**

X	0	1	2	5
f(x)	2	3	12	147

(B) Given $y'=x^2+y$ & $y(0)=1$. Solve the above differential equation using Euler's Modified method taking h=0.05 & find the value for y at x=0.1 **07**

OR

Q.3 **(A)** Given the values: **07**

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

Evaluate f(9) using Newton's Divided Difference formula.

(B) Using the Runge-Kutta method of fourth order find y for x=0.1,0.2,0.3 given that $y'=xy+y^2$ & $y(0)=1$. **07**

Q.4 **(A)** The lifetime of electric bulbs for a random sample of 10 from a large consignment gave the following data: **07**

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 lifetime of bulbs is 4,000 hours?

(B) An established company has decided to add a new product to its line. It will buy the product from a manufacturing firm, package it & sell it to selected distributors. The steps in the following table are to be planned. **07**

Activity	Description	Predecessors	Duration (Days)
A	Organize sales office	-	6
B	Hire Salesmen	A	4
C	Train Salesmen	B	7
D	Select advertising agency	A	2
E	Plan advertising campaign	D	4
F	Conduct advertising campaign	E	10
G	Design package	-	2
H	Set up packaging facilities	G	10
I	Package initial stocks	J, H	6
J	Order stock from manufacturer	-	13
K	Select distributors	A	9
L	Sell to distributors	C, K	3
M	Ship stocks to distributors	I, L	5

Draw a network diagram & obtain the critical path.

OR

Q.4 **(A)** Two laboratories A & B carry out independent estimates of fat content in ice-cream made by a firm. A sample is taken from each batch, halved & the separated halves are sent to the labs. The fat content is recorded as below: **07**

Batch	1	2	3	4	5	6	7	8	9	10
Lab A	7	8	7	3	8	6	9	4	7	8
Lab B	9	8	8	4	7	7	9	6	6	6

Is there a significant difference between the mean fat content obtained by the two laboratories?

(B) An insurance company has decided to modernize one of its branch offices. Some of the existing office equipments will be disposed off but the remaining will be returned to the branch after renovation. Tenders are invited from contractors. The following major elements of the project are to be planned. **07**

Activity	Description	Duration (weeks)	Predecessors
A	Design new premises	14	-
B	Obtain tenders from the contractors	4	A
C	Select the contractor	2	B
D	Arrange details with selected contractor	1	C
E	Decide which equipment is to be used	2	A
F	Arrange storage of equipment	3	E
G	Arrange disposal of other equipment	2	E
H	Order new equipment	4	E
I	Take delivery of new equipment	3	H, L
J	Renovations take place	12	K
K	Remove old equipment	4	D, F, G
L	Cleaning after the contractor has finished	2	J
M	Return old equipment for storage	2	H,L

Draw a network diagram showing the inter relations between the various activities of the project. Construct the critical path.

Q.5 (A) The screws produced by a certain machine were checked by examining the number of defectives in a sample of 128. The following table shows the distribution of 128 samples according to the number of defective items they contained. **07**

Number of defectives	0	1	2	3	4	5	6	7	Total
Number of samples	7	6	19	35	30	23	7	1	128

Fit a binomial distribution & find the expected frequencies if the chance of the machine being defective is $1/2$. Find the mean & variance of the fitted distribution.

(B) A dice was thrown 9000 times & a throw of 5 or 6 was obtained 3240 times. On the assumption of random throwing, does the data indicate an unbiased dice? **07**

OR

Q.5 (A) In an intelligence test administered to 1000 students the average score was 42 and the standard deviation 24. Find the following: **07**
    (a) The number of students exceeding a score of 50.
    (b) The number of students lying between the score of 30 & 54.
    (c) The value of the score exceeded by top 100 students.

(B) In Mumbai, 20% of a random sample of 900 school boys had a certain slight physical defect. In Delhi, 18.5% of a random sample of 1600 boys had the same defect. Is the difference between the proportions significant? **07**

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