

INDIAN MARITIME UNIVERSITY

Time Bound Assignment

B Tech (ME) Arrear Examinations

September/October 2020

UG11T3301

Computational Mathematics

Date: 08/09/2020

Max Marks: 70

Duration: 3 Hrs

Pass Marks: 35

- Note:**
- Use of approved type of scientific calculator is permitted.
 - The symbols have their usual meanings.

Section-A

(10x2=20 Marks)

(All Questions are Compulsory)

- 100 samples of size 64 each was taken from a population. The population variance is 49. What is the standard deviation of each sample mean?
- Use the shifting operator E to derive the Newton's forward interpolation formula for the function $f(x_0 + ph)$ where $p = (x - x_0)/h$
- Demonstrate by means of truth table the validity of the following Boolean algebra expression $x.(y + z) = (x.y) + (x.z)$
- Reaction times in a population have a standard deviation of 20 seconds. If the standard deviation of the sample mean reaction time is 2 seconds, find the sample size.
- Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by Simpson's 1/3rd rule taking $h = 1/4$
- Prove that $E = e^{hD}$
- Fit a straight line to the data by the method of least squares.

x	1	2	3	4	5
y	14	27	40	55	68

8. Draw a binary search tree for the following numbers:48,2,98,12,56,32,4,67
9. What is the relationship between Δ and E
10. What is the difference between weighted and non-weighted binary codes?

Section – B

(5x10=50 Marks)

(Answer any 5 of the following)

11. (a) Fit a second degree parabola $y = ax^2 + bx + c$ to the following data using least squares method.

(5 marks)

$x :$	1.0	1.5	2.0	2.5	3.0	3.5	4.0
$y :$	1.1	1.3	1.6	2.0	2.7	3.4	4.1

- (b) An experiment gave the following values:

(5 marks)

$v(ft/min)$	350	400	500	600
$t(min)$	61	26	7	2.6

It is known that v and t are connected by the relation $v = at^b$. Find the best possible values of a and b

12. (a) Find the correlation coefficient between x and y from the following data

(5 marks)

$x :$	1	2	3	4	5
$y :$	2	5	3	8	7

- (b) Establish the formula $r = \frac{\sigma_x^2 + \sigma_y^2 - \sigma_{x-y}^2}{2\sigma_x\sigma_y}$

(5 marks)

13. (a) Draw the logical diagram for the two input NAND Gate and give the corresponding truth table

(5 marks)

(b) Design an efficient algorithm for finding the sum of first n Fibonacci numbers.

(5 marks)

14. (a) Find $y'(1.1)$ and $y''(1.1)$ from the following data table: **(5 marks)**

$x:$	1.0	1.1	1.2	1.3	1.4	1.5	1.6
$y:$	7.989	8.403	8.781	9.129	9.451	9.750	10.031

(b) Determine the speed of an athlete at $t = 5 \text{ sec}$ correct to two decimal places from the distance covered by the athlete s given in the following table: **(5 marks)**

$time(sec):$	0	1	2	3	4	5	6
$Distance(metre):$	0	2.5	8.5	15.5	24.5	36.5	50

15. (a) Find a real root of the equation $x^3 - 2x - 5 = 0$ by the regula falsi method correct to two decimal places. **(5 marks)**

(b) Apply Runge -Kutta fourth order method, to find an approximate value of y when $x = 0.2$ given that $dy/dx = x+y$ and $y = 1$ when $x = 0$ **(5 marks)**

16. (a) Solve $(E^3 - 2E^2 - 5E + 6)u_n = 0$ **(5 marks)**

(b) Solve $(E^2 - 5E - 6)y_n = 4^n$ given $y_0 = 0, y_1 = 1$ **(5 marks)**

17. (a) Find the missing term in the table: **(5 marks)**

$x:$	2	3	4	5	6
$y:$	45.0	49.2	54.1	67.4

(b) In a partially destroyed laboratory record, only the lines of regression of y on x and x on y are available as $4x - 5y + 33 = 0$ and $20x - 9y - 107 = 0$ respectively. Calculate \bar{x} and \bar{y} and the coefficient of correlation between x and y **(5 marks)**

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