INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

End Semester Examination Dec 2019/Jan 2020

B.Tech (Marine Engineering)

Semester -III

UG11T1301/2301- Computational Mathematics

Date: 10.12.2019 **Max Marks: 70**

Time: 3 Hours **Pass Marks: 35**

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

Part-A (2x10=20 Marks)

(All Questions are Compulsory)

1. Prove that $\Delta = E - 1$
2. For a given set of (x, y) values, how would you fit the curve $y = ax^b$ using principle of least square method?
3. Construct the truth table for $(p \to q) \wedge (q \to p)$
4. 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 $20x - 9y = 107$ respectively. Calculate $\bar{x}$, $\bar{y}$ and the coefficient of correlation between x and y.
5. Derive newton's backward interpolation formula using the shift operator E.
6. Find the divided differences of $f(x) = x^3 + x + 2$ for the arguments $1, 3, 6, 11$.
7. Draw a binary search tree to sort the random numbers 30,15,60,22,45,75,7,17,27
8. Show that $x.(x + y) = x$
9. Solve $u_{n+3} - 2u_{n+2} - 5u_{n+1} + 6u_n = 0$
10. Explain about Bubble sort problem with suitable example

Part – B (10 x5=50 Marks)

(Answer any 5 of the following)

11. a) Simplify $x \vee y \wedge y \vee z \wedge y \vee z'$ **[5 Marks]**

    b) Show that $x \vee y \wedge y \vee z \wedge z \vee x = (x \wedge y) \vee (y \wedge z) \vee (z \wedge x)$ **[5 Marks]**

12. a) Three judges A, B, C give the following ranks. Find which pair of judges has common approach. **[5 Marks]**

A:	1	6	5	10	3	2	4	9	7	8
B:	3	5	8	4	7	10	2	8	6	9
C:	6	4	9	8	1	2	3	10	5	7

b). If θ is the angle between the two regression lines, show that

$$\tan\theta = \frac{1-r^2}{r}\frac{\sigma_x\sigma_y}{{\sigma_x}^2 + {\sigma_x}^2}.$$

Explain the significance when $r = 0$ and $r = \pm 1$ **[5 Marks]**

13. a) Fit a second degree Parabola to the following data: **[5 Marks]**

x:	0	1	2	3	4
y:	1	1.8	1.3	2.5	6.3

b) Find the least squares fit of the form $y = a + bx^2$ to the following data: **[5 Marks]**

x:	-1	0	1	2
y:	2	5	3	0

14. a) Prove $u_0 + u_1 x + \frac{u_2 x^2}{2!} + \frac{u_3 x^3}{3!} + \cdots \infty = e^x \left(u_0 + x\Delta u_0 + \frac{x^2}{2!}\Delta^2 u_0 + \cdots\right)$ **[5 Marks]**

b) Find cubic polynomial to the following data:

x:	0	1	2	3
f(x):	1	2	1	10

And find $f(4)$ **[5 Marks]**

15. a) Given that

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

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.6$ **[5 Marks]**

b) Evaluate $\int_0^6 \frac{dx}{1+x}$ using simpson's $3/8^{th}$ rule. Taking h=1. **[5 Marks]**

16. a) Solve $y_{n+2} - 4y_n = n^2 + n - 1$ **[5 Marks]**

b) Evaluate $\Delta^2 \left(\frac{5x+12}{x^2+5x+16}\right)$ **[5 Marks]**

17. a) Write an Algorithm to find the sum of first n natural number. **[5 Marks]**

b) Write an algorithm to find an exponential series e^x. **[5 Marks]**

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