

INDIAN MARITIME UNIVERSITY
(A Central University, Govt.of India)

May/June 2015 End Semester Examinations

SEMESTER – III, B.TECH (MARINE ENGINEERING)

COMPUTATIONAL MATHEMATICS (T 2301 / T 1301)

Date:06.06.2015
Time:-3 Hrs

Max.Marks:100
Pass Marks:50

Note : (i) Non- Programmable scientific calculator is allowed
(ii) Attempt **six** questions
(iii) Question no.1 is **compulsory**

PART – A **(3 x10 = 30 Marks)**
(Compulsory Questions)

1. a) Prove that: $\Delta \nabla = \nabla \Delta = \delta^2$
- b) Solve the difference equation: $y_{n+1} - 4y_n = 2^n$
- c) Draw the circuit to show Boolean function: $(p \wedge q) \wedge (r \vee s)$.
- d) Explain the method of least squares to fit a line $y = ax + b$ through the given set of points.
- e) Write and explain Newton's backward interpolation formula.
- f) Express $y = 2x^3 - 3x^2 + 3x - 10$ in a factorial notation and hence show that $\Delta^3 y = 12$.
- g) The regression equations of two variables x and y are $x = 0.7y + 5.2$, $y = 0.3x + 2.8$. Find the means of the variables and the coefficient of correlation between them.
- h) Evaluate: $\int_0^6 \frac{dx}{1+x^2}$ by using Simpson's 1/3rd rule.
- i) Write an efficient algorithm to calculate the series of cos x, include terms up to four decimal places.
- j) In Boolean algebra show that: $x + (x.y) = x$.

PART – B **(5 x14 = 70 Marks)**
(Answer any five of the following)

2. a) An experiment gave the following values:

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.

(7)

- b) If V (km/hr) and R (kg/ton) are related by a relation of the type $R = a + bV^2$, find by the method of least squares, a and b with the help of following table.

(7)

V	10	20	30	40	50
R	8	10	15	21	30

3. a) If θ be the angles between regression lines of y on x and x on y, then show

$$\text{that: } \tan \theta = \frac{1-r^2}{r} \cdot \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2} \quad (7)$$

- b) For 8 pairs of observations of x and y calculate the coefficient of correlation.

$$\text{Given that: } \sum(x - \bar{x})(y - \bar{y}) = 24, \quad \sum(y - \bar{y})^2 = 44, \quad \sigma_x^2 = 4.5. \quad (7)$$

4. a) Determine f(x) as a polynomial in x for the following data using Newton's divided difference formula: (7)

x	-4	-1	0	2	5
f(x)	1245	33	5	9	1335

- b) A rod is rotating in a plane. The following table gives the angle θ (radians) through which the rod has turned for the various values time t second.

t	0	0.2	0.4	0.6	0.8	1.0	1.2
θ	0	0.12	0.49	1.12	2.02	3.20	4.67

Calculate the angular velocity and angular acceleration of the rod when

$$t=0.2 \text{ second} \quad (7)$$

5. a) Prove that: (7)

$$u_1 x + u_2 x^2 + u_3 x^3 + \dots = \frac{x}{1-x} u_1 + \left(\frac{x}{1-x}\right)^2 \Delta u_1 + \left(\frac{x}{1-x}\right)^3 \Delta^2 u_1 + \dots$$

- b) Simplify the following: (7)

$$\text{i) } (y \vee x) \wedge (y \vee z) \wedge (y \vee z') \quad \text{ii) } (x \vee y) \wedge [y \vee (x \wedge y)']$$

6. a) Design an algorithm for generating n terms of the Fibonacci series. (7)

- b) Design an efficient algorithm for finding factorial of a positive integer n=50. (7)

7. a) Solve the difference equation: $y_{x+2} - 4y_x = x^2 + x - 1$ (7)

- b) The velocity v (km/min) of a moped which starts from rest is given at fixed intervals of time t (min) as follows:

t	2	4	6	8	10	12	14	16	18	20
v	10	18	25	29	32	20	11	5	2	0

Estimate approximately the distance covered in 20 minutes. (7)
