

INDIAN MARITIME UNIVERSITY
(Central University, Government of India)

May/June 2016 End Semester Examinations
B.Tech. (Marine Engineering)

Third Semester – Computational Mathematics (UG11 T1301/ T 2301)

Date : 23.06.2016

Max. Marks: 100

Time: 3 Hrs

Part – A
Compulsory Question

(3 X 10 = 30 Marks)

- 1) a). Fit a straight line $y=a+bx$ by the method of least square to the following data.

X	0	1	3	6	8
Y	1	3	2	5	4

- b) How will you fit a least square curve for $y=ab^x$

- c) In Boolean algebra show that $x.(x+y) = x$

- d) Construct the polynomial for the following data by Newton's forward interpolation formula

X	4	6	8	10
y	1	3	8	16

- e) Solve the difference equation $y_{n+2}-3y_{n+1}+2y_n = 0$.

- f) What is the relation between Δ and E

- g) The regression lines for y on x is $2y = x + a$ and for x on y is $5x = 2y + b$, where a, b are constants. Find the correlation coefficient, r_{xy} .

- h) Complete the truth table for the following Boolean functions :

p	q	\bar{p}	\bar{q}	$\bar{p} \wedge \bar{q}$	$p \wedge q$	$(\bar{p} \wedge \bar{q}) \vee (p \wedge q)$
0	0					
0	1					
1	0					
1	1					

- i) Evaluate by Simpson's (1/3)rd rule $\int_{0.0}^{0.6} e^x dx$ using six intervals.

- j) Write an algorithm to compute terms in the expansion of $\sin x$.

Part – B
Answer Any Five of the following

(5 x 14 = 70 Marks)

- 2) Draw the circuit diagram for the following boolean function.

$$f = p_1 \wedge (p_2 \wedge p_3) \vee (p_4 \wedge (p_5 \vee p_6))$$

Also write the compliment of the above function and draw the circuit diagram. (14 Marks)

- 3) a. Construct Newton's forward interpolation polynomial for the following data.

X	4	6	8	10
y	1	3	8	16

Evaluate y for x=5.

- b. Estimate the values of f(22) and f(42) from the following available data. (7+7 Marks)

x	20	25	30	35	40	45
f(x)	354	332	291	260	231	204

- 4) a. Estimate length of the curve $3y = x^3$ from (0,0) to (1,3) using Simpson's $\frac{1}{3}$ rd Rule taking 8 subintervals.

- b. A train is moving at the speed of 30m/sec. Suddenly brakes are applied. The speed of the train per second after t seconds is given by.

Time(t)	0	5	10	15	20	25	30	35	40	45
Speed(v)	30	24	19	16	13	11	10	8	7	5

Apply Simpson's $\frac{3}{8}$ th rule to determine the distance moved by the train in 45 seconds. (7+7 Marks)

- 5) a. Prove that $u_1x + u_2x^2 + u_3x^3 + \dots = \left(\frac{x}{1-x}\right) u_1 + \left(\frac{x}{1-x}\right)^2 \Delta u_1 + \left(\frac{x}{1-x}\right)^3 \Delta^2 u_1 + \dots$

- b. Sum the series $1.2 + 2.3x + 3.4x^2 + \dots + \infty$ (7+7 Marks)

- 6) a. Solve $(E^3 - 5E^2 + 8E - 4)y_n = 0$ given $y_0 = 3$; $y_1 = 2$; $y_4 = 22$.

- b. Solve $(E^2 - 5E - 6)y_n = 4^n$ gives $y_0 = 0$; $y_1 = 1$. (7+7 Marks)

- 7) (a) An experiment gave the following values of velocity v and time t :

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

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

- (b) Fit the parabola $y = a + bx + cx^2$ to the following data :

x:	2	4	6	8	10
y:	3.07	12.85	31.47	57.38	91.2

(7+7 Marks)

8) Prove the following identities :

$$(i) \delta\mu = \frac{1}{2}(\Delta + \nabla) \quad (ii) 1 + \frac{\delta^2}{2} = \sqrt{(1 + \delta^2\mu^2)}$$

$$(iii) \nabla^2 = h^2 D^2 - h^3 D^3 + \frac{7}{12} h^4 D^4 - \dots \quad (iv) \Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$$

(3+3+4+4 Marks)

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

(b) Write an efficient algorithm to generate Fibonacci numbers.

(7+7 Marks)
