

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)

June 2016 End Semester Examinations
B.Sc. (Nautical Science) - 2013 batch onwards
Semester III
Applied Mathematics – IV
(UG21T2303)

Date : 07.07.2016/F.N

Time: 3 Hrs

Maximum Marks: 70

Pass Marks : 28

NOTE: Attempt any SEVEN questions. All questions carry equal marks
Use of Non-programmable scientific calculator is allowed.

7x10=70

1. Using Newton – Raphson method find a root of the following equation correct to the three decimal places: $xe^x - 2 = 0$

2. Solve the following equations by Gauss-Elimination method:

$$2x - y + 3z = 9; x + y + z = 6; x - y + z = 2.$$

3. If $u(x)$ and $v(x)$ be two functions of x , prove that

$$\begin{aligned} i) \Delta[u(x) v(x)] &= u(x) \Delta v(x) + v(x+1) \Delta u(x) \quad (ii) \Delta \left\{ \frac{u(x)}{v(x)} \right\} \\ &= \frac{v(x) \Delta u(x) - u(x) \Delta v(x)}{v(x) v(x+1)} \end{aligned}$$

4 a) Apply Bessel's formula to find the value of $f(27.5)$ from the table:

x	25	26	27	28	29	30
f(x)	4.000	3.846	3.704	3.571	3.448	3.333

5. The table below shows the temperature $f(t)$ as a function of time:

t	1	2	3	4	5	6	7
f(t)	81	75	80	83	78	70	60

Using Simpson's $\frac{1}{3}$ rd rule, estimate $\int_1^7 f(t) dt$.

6 a) Find the polynomial interpolating the data:

x	0	1	2
f(x)	0	5	2

b) Use Lagrange's interpolation formula to find the value of y when $x = 10$, if the following values of x and y are given:

x	5	6	9	11
y	12	13	14	16

7. Verify Stoke's theorem for $\mathbf{F} = (x^2 + y^2)\mathbf{I} - 2xy\mathbf{J}$ taken around the rectangle bounded by the lines $x = \pm a$, $y = 0$, $y = b$.

8 Use Divergence theorem to evaluate $\int_S \mathbf{F} \cdot d\mathbf{S}$ where $\mathbf{F} = x^3\mathbf{I} + y^3\mathbf{J} + z^3\mathbf{K}$, and S is the surface of the sphere $x^2 + y^2 + z^2 = a^2$.

9. If $\mathbf{F} = 3xy\mathbf{I} - y^2\mathbf{J}$, evaluate $\int_C \mathbf{F} \cdot d\mathbf{R}$ where C is the curve in the xy -plane $y = 2x^2$ from $(0,0)$ to $(1,2)$.