

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)
END SEMESTER EXAMINATION-DECEMBER 2019
B.Sc(Nautical Science)
Semester – III
Applied Mathematics-IV
(UG21T2303)

Date: 11.12.2019

Max Marks: 70

Time: 3 Hrs

Pass Marks : 35

Answer any 7 questions out of 9. All questions carry equal marks.

1. a. Solve the following system of equations by Jacobi's iteration method.

$$20x + y - 2z = 17$$

$$3x + 20y - z = -18$$

$$2x - 3y + 20z = 25$$

(10 marks)

2. Find the missing values in the following data

x	45	50	55	60	65
F(x)	3.0	...	2.0	...	-2.4

(10 marks)

3. a. Find the cubic polynomial which takes the following values.

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

- b. Use Simpson's $\frac{1}{3}$ rd rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking 7 ordinates.

(5+5 marks)

4. 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

(10 marks)

5. Prove that $u_0 + u_1x + u_2x^2 + \dots \infty = \frac{u_0}{1-x} + \frac{x\Delta u_0}{(1-x)^2} + \frac{x^2\Delta^2 u_0}{(1-x)^3} + \dots$
Hence sum the series $1.2 + 2.3x + 3.4x^2 \dots \infty$

(10 marks)

6. Find the total work done by the force $\vec{F} = 3xy\hat{i} - y\hat{j} + 2zx\hat{k}$ in moving a particle around the circle $x^2 + y^2 = 4$

(10 marks)

7. Use Divergence theorem to evaluate $\int_S \vec{F} \cdot dS$ where $\vec{F} = x^3\hat{i} + y^3\hat{j} + z^3\hat{k}$, and S is the surface of the sphere $x^2 + y^2 + z^2 = a^2$.

(10 marks)

8. If $F = 3xy\hat{i} - y^2\hat{j}$, evaluate $\int_C F \cdot dR$ where C is the curve in the xy plane $y = 2x^2$ from $(0, 0)$ to $(1, 2)$

(10 marks)

9. If $\vec{F} = 3y\hat{i} - xz\hat{j} + yz^2\hat{k}$ and S is the surface of the paraboloid $2z = x^2 + y^2$ bounded by $z = 2$. Evaluate $\int \int_S (\nabla \times \vec{F}) \cdot d\vec{S}$. Using stokes theorem.

(10 marks)
