INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

END SEMESTER EXAMINATION-DECEMBER 2019

B.Sc(Nautical Science)

Semester – II

Applied Mathematics

(UG21T3201)

Date: 31.12.2019	Max Marks: 70
Time: 3 Hrs	Pass Marks : 35

Note: Part A is compulsory.

Answer any 6 from remaining 7 questions of Part B.

PART A

(5 x 2 = 10 marks)

1. a. Evaluate div $\bar{F}$ and curl $\bar{F}$ at the point (1, 1, 1) for

   $\bar{F} = 3x^2\hat{\imath} + 5xy^2\hat{\jmath} + 5xyz^2\hat{k}$.

   b. Solve $\cos^2 x \frac{dy}{dx} + y = \tan x$.

   c. Derive a partial differential equation from $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$

   d. Prove $\nabla = \Delta E^{-1}$.

   e. Find Laplace transform of cos (3t + 5) .

PART B

2. a. Find the values of a and $b$such that the surface $ax^2 - byz = (a+2)x$ and $4x^2y + z^3 = 4$ cut orthogonally at (1, -1, 2)

   b. Compute the line integral $\int_c (y^2dx - x^2dy)$ about the triangle whose vertices are (1, 0), (0,1) and (-1, 0).

   (5+5 marks)

3. a. Solve $(D^3 + 1)y = \cos(2x - 1)$.

   b. Solve $(x^2 + y^2 + 2x)dx + 2y\,dy = 0$.

   (5+5 marks)

4. a. Solve $q^2 = z^2p^2(1 - p^2)$.

   b. Solve $(p^2 + q^2)y = qz$.

   (5+5 marks)

5. a. Prove that

$$u_0 + u_1 x + u_2 x^2 + \cdots \infty = \frac{u_0}{1-x} + \frac{x\Delta u_0}{(1-x)^2} + \frac{x^2\Delta^2 u_0}{(1-x)^3} + \cdots \infty$$

b. Hence sum the series $1.2 + 2.3x + 3.4x^2 + \ldots \infty$

(5+5 marks)

6. a. Find Laplace transform of $\int_0^t \frac{e^{-1} Sin\, t}{t}\, dt$.

b. Find inverse Laplace transform of $\log\left(\frac{S+1}{S-1}\right)$.

(5+5 marks)

7. a. Evaluate $\int_0^{0.6} e^{-x^2}\, dx$ by using Simpson's $\frac{1}{3}^{rd}$ rule by taking 7 ordinates.

b. Evaluate $\int_c (x^2 - 2xy)\, dx + (x^2 y + 3)dy$around the boundary of the region defined by $y^2 = 8x$ and $x = 2$.

(5+5 marks)

8. a. Apply GAVSS Seidel iteration to solve the following equations.

$$20x + y - 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3y + 20z = 25$$

b. Solve by the method of variation of parameters

$$\frac{d^2y}{dx^2} + 4y = tanx$$

(5+5 marks)

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