INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

END SEMESTER EXAMINATION-DECEMBER 2019

B.Sc(Nautical Science)

Semester – III

APPLIED MATHEMATICS – III

(UG21T2302)

Date: 10.12.2019	Max Marks: 70
Time: 3 Hrs	Pass Marks : 35

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

1. a. Find the Laplace transform of $f(x) = |t-1| + |t+1|, t \geq 0$

   b. Find the Laplace transform of $f(t) = t^2 \quad for\ 0 < 1\ t \leq 2$

   $= t - 1\ for\ \ 2 < t \leq 3$

   $= 1 \qquad for\ t > 3$

   (5+5 marks)

2. Evaluate (i)$L\left[\int_0^t \frac{\sin t}{t}\, dt\right]$ (ii) $L^{-1}\left[\int_0^t e^{-t}\, cost\, dt\right]$

   (10 marks)

3. Find (i) $L^{-1}\left(\log\left(\frac{S+1}{S-1}\right)\right)$ (ii) $L^{-1}\left(\tan^{-1}\left(\frac{2}{S^2}\right)\right)$

   (10 marks)

4. Apply convolution theorem to evaluate $L^{-1}\left(\frac{s}{(s^2+a^2)^2}\right)$

   (10 marks)

5. Solve by the method of Laplace Transforms the equation

   $\frac{d^2y}{dt^3} + 2\,\frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = 0$given.

   $y(0) = y'(0) = 0\ \&\ y''(0) = 6$

(10 marks)

6. Evaluate $J_{\frac{1}{2}}x$

(10 marks)

7. Express $J_{5(x)}$ in terms of $J_0(x)$ and $J_1(1)$.

(10 marks)

8. Express $f(x) = x^4 + 3x^2 - x^2 + 5x - 2$ in terms of Legendre Polynomials

(10 marks)

9. a. Prove Rodrigues Formula that

$$P_x(x) = \frac{1}{n!\,2n}\frac{d^n}{dx^n}(x^2-1)^n$$

(10 marks)

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