INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

END SEMESTER EXAMINATION-DECEMBER 2019

B.Sc(Nautical Science)

Semester – II

APPLIED MATHEMATICS

(UG21T4201)

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

Note: Question No. 1 is compulsory.

Solve any 6 questions from remaining 8 questions.

Use of approved type Scientific Calculator is permitted.

Q 1. Attempt the following : (5X2 =10marks)

a. If $\boldsymbol{F} = (x + y + 1)\boldsymbol{I} + \boldsymbol{J} - (x + y)\boldsymbol{K}$, show that $\boldsymbol{F}.curl\,\boldsymbol{F} = 0$.

b. Solve $\{y\left(1 + \frac{1}{x}\right) + \cos y\}\,dx + (x + logx - xsiny)dy = 0$.

c. Solve $\frac{\partial^2 z}{\partial x \partial y} = \frac{x}{y} + a$.

d. Prove that $\mu = \frac{1}{2}\,(\boldsymbol{E}^{\frac{1}{2}} + \boldsymbol{E}^{\frac{-1}{2}})$

e. Find the Laplace transforms of $e^{-3t}(2\cos 5t - 3\sin 5t)$.

Q 2. a) Find a unit vector normal to the surface $xy^3z^2 = 4$ at the point (-1,-1, 2). (5 marks)

b) A vector field is given by $\boldsymbol{F} = \sin y\,\boldsymbol{I} + x(1 + cosy)\boldsymbol{J}$. Evaluate the line integral over a circular path given by $x^2 + y^2 = a^2, z = 0$. (5 marks)

Q 3. a) Solve : $(1 + y^2)dx = (\tan^{-1} y - x)dy$. (5 marks)

b) Solve : $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 4y = e^x cosx$ (5 marks)

Q 4.

a) Solve: $q^2 = z^2p^2(1 - p^2)$. (5 marks)

b) Solve by Char pit's Method: $(p^2 + q^2)y = qz$. (5 marks)

Q 5. a) Find a real root of the equation $xlog_{10}\,x = 1.2$ by regula-falsi method correct to four decimal places. (5 marks)

b) Find the cubic polynomial which takes the following values :

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

Hence or otherwise evaluate f(4). (5 marks)

Q 6.

a) Find the Laplace transform of $\int_0^\infty e^{-t}\left(\frac{\cos at-\cos bt}{t}\right) dt$.
(5 marks)

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

Q 7. a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Simpson's 3/8 rule. (5marks)

b) Verify Green's theorem for $\int_C [(xy+y^2)dx+x^2dy]$, where C is bounded by $y = x \; and \; y = x^2$. (5marks)

Q 8. a) Apply Gauss elimination method to solve the equations $x+4y-z=-5\,; x+y-6z=-12\,; 3x-y-z=4$. (5marks)

b) Solve by method of variation of parameters:
$\frac{d^2y}{dx^2}+4y=\tan 2x$. (5marks)

Q 9. a) Solve : $r+4s-5t=\sin(2x+3y)$ (5marks)

b) Solve by using Laplace transform method
$(D^3-3D^2+3D-1)y=t^2e^t$ given that
$y(0)=1\,,\; y'(0)=0 \; and \; y''(0)=-2.$ (5marks)