INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

END SEMESTER EXAMINATION MAY/JUNE 2018

Programme: B.Sc (Nautical Science) **Semester: II**

Subject Name: Applied Mathematics **Subject Code: UG21T3201**

Date: 05.06.2018 **Maximum Marks: 70**

Duration: 3 hrs. **Pass Marks: 35**

Note: Q.No.1 is compulsory.
Solve any SIX questions from remaining eight questions.
All questions carry equal marks.
Use of approved type Scientific Calculator is permitted.

Q.1 Attempt the following: (10 Marks)

a) Evaluate $div\, F$ and $curl\, F$ at the point $(1,2,3)$ for $F = x^2yzi + xy^2zj + xyz^2k$.

b) Solve $\left(y^2\, e^{xy^2} + 4x^3\right)dx + \left(2xy\, e^{xy^2} - 3y^2\right)dy = 0$.

c) Solve $\frac{\partial^2 z}{\partial x^2} = xy$.

d) Show that $\Delta \log\left(f(x)\right) = \log\left\{1 + \frac{\Delta f(x)}{f(x)}\right\}$.

e) Find the Laplace transform of t^2e^{2t} .

Q.2 a) Calculate the angle between the normals to the surface $xy = z^2$ at the points (4,1,2) and (3,3,-3) . (5 Marks)

b) If $A = (3x^2 + 6y)i - 14yz\, j + 20xz^2\, k$, evaluate $\int A.dR$ from (0,0,0) to (1,1,1) along the path $x = t\,, y = t^2\,, z = t^3$. (5 Marks)

Q.3 a) Solve $\frac{d^2y}{dx^2} + \frac{dy}{dx} = \cos x$. (5 Marks)

b) Solve $x^2\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} - 4y = x^4$. (5 Marks)

Q.4 a) Solve the equation: $xp - yq = y^2 - x^2$. (5 Marks)

b) Solve $pxy + pq + qy = yz$. (5 Marks)

Q.5 a) Develop a recurrence formula for finding $\sqrt{N}$,using Newton Raphson method and hence compute to three decimal places $\sqrt{10}$. (5 Marks)

b) Find the number of men getting wages below Rs.15 from the following data:

Wages in Rs.	0-10	10-20	20-30	30-40
frequency	9	30	35	42

(5 Marks)

Q.6 a) Evaluate $\int_0^\infty t\, e^{-2t} \sin 3t \; dt$ (5 Marks)

b) Using convolution theorem evaluate $L^{-1}\left[\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right]$. (5 Marks)

Q.7 a) Evaluate $\int_0^1 \frac{dx}{1+x}$ applying Simpson's 3/8th rule. (5 Marks)

b) Evaluate $\int_C [(x^2+xy)dx + (x^2+y^2)dy]$, where C is the square formed by the lines $x = \pm 1 , y = \pm 1$. (5 Marks)

Q.8 a) Solve the following equations by Gauss elimination method:

$x + y + z = 9 , 2x - 3y + 4z = 13 , 3x + 4y + 5z = 40$. (5 Marks)

b) Solve by the method of variation of parameters $\frac{d^2y}{dx^2} + a^2 y = cosec\, ax$. (5 Marks)

Q.9 a) Solve $\frac{\partial^3 z}{\partial x^3} - 4\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial x\, \partial y^2} = 2\sin(3x+2y)$. (5 Marks)

b) Solve the following equation by transform method:

$y'' + y = t \quad given \;\; y(0) = 1 , y'(0) = 0$. (5 Marks)
