

INDIAN MARITIME UNIVERSITY

(A Central University, Govt. of India)

B.SC. (NAUTICAL SCIENCE)

END SEMESTER EXAMINATIONS JUNE-JULY 2019

SEMESTER II

APPLIED MATHEMATICS

(UG21T3201)

Date: 25-06-2019

Max Marks: 70

Time: 3Hrs

Pass Marks: 35

Note: Q. No. 1 is compulsory.

Solve any SIX questions from remaining eight question.

All questions carry equal marks.

Use of approved type Scientific Calculator is permitted.

- Q.1 Attempt the following: (5X2=10 marks)
- Find 'a' such that the vectors $2\mathbf{i} - \mathbf{j} + \mathbf{k}$, $\mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$ and $3\mathbf{i} + a\mathbf{j} + 5\mathbf{k}$ are coplanar.
 - Solve: $y(\log y)dx + (x - \log y)dy = 0$.
 - Solve: $\frac{\partial^2 u}{\partial x \partial t} = e^{-t} \cos x$
 - Prove: $y_3 = y_1 + \Delta y_1 + \Delta^2 y_0 + \Delta^3 y_0$
 - Find the Laplace transform of $\sin^3 2t$.
- Q.2 a) Find the directional derivative of $f = x^2 - y^2 + 2z^2$ at the point P (1,2,3) in the direction of the line PQ where Q is the point (5,0,4). Also calculate the magnitude of the maximum directional derivative. (5 marks)
- b) Find the total work done in moving a particle in a force field given by $F = 3xy\mathbf{i} - 5z\mathbf{j} + 10x\mathbf{k}$ along the curve $x = t^2 + 1$, $y = 2t^2$, $z = t^3$ from $t = 1$ to $t = 2$. (5 marks)
- Q.3 a) Solve: $\frac{d^2 y}{dx^2} - y = e^x + x^2 e^x$ (5 marks)
- b) Solve: $x^3 \frac{d^3 y}{dx^3} + 3x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = x + \log x$ (5 marks)
- Q.4 a) Solve the equation: $p^2 + q^2 = x^2 + y^2$ (5 marks)

b) Solve : $2z+p^2+qy+2y^2 = 0$ (5 marks)

Q.5 a) State the iterative formula to find $\sqrt[k]{N}$, using Newton - Raphson formula and compute $\sqrt[3]{24}$, correct to four decimal places. (5 marks)

b) The following are the measurements T made on a curve recorded by oscillograph representing a change of current I due to a change in the conditions of an electric current.

T	1.2	2.0	2.5	3.0
I	1.36	0.58	0.34	0.20

Using Lagrange's formula, find I at T = 1.6. (5 marks)

Q.6 a) Evaluate $L \int_0^t \frac{te^t \sin t}{t} dt$. (5 marks)

b) Find $L^{-1}\left(\frac{1}{s(s+a)^3}\right)$ (5 marks)

Q.7 a) A curve is drawn to pass through the points given by the following table:

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

Estimate the area bounded by the curve, x-axis and the lines $x = 1$, $x = 4$. (5 marks)

b) Use Stoke's theorem to evaluate $\int [(x + y)dx + (2x - z)dy + (y + z)dz]$, over the curve C, where C is the boundary of the triangle with vertices $(2,0,0)$, $(0,3,0)$, $(0,0,6)$. (5 marks)

Q.8 a) Solve by Jacobi's iteration method, the equations $20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$, upto four iterations. (5 marks)

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

Q.9 a) Solve $4 \frac{\partial^2 z}{\partial x^2} - 4 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 16 \log(x + 2y)$ (5 marks)

b) Solve the equation by the transform method:

$y'' - 3y' + 2y = e^{3t}$, when $y(0) = 1$ and $y'(0) = 0$. (5 marks)