

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)

a) 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.

b) Solve: $y (\log y) dx + (x - \log y) dy = 0$.

c) Solve : $\frac{\partial^2 u}{\partial x \partial t} = e^{-t} \cos x$

d) Prove : $y_3 = y_2 + \Delta y_1 + \Delta^2 y_0 + \Delta^3 y_0$

e) 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 oscilograph 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 $L \int_0^t \frac{e^t \sin t}{t} dt$. (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)