

INDIAN MARITIME UNIVERSITY

(A CENTRAL UNIVERSITY, GOVT.OF INDIA)

DEC.17/JAN.18 END SEMESTER EXAMINATIONS

B.Sc. NAUTICAL SCIENCE - SECOND SEMESTER

APPLIED MATHEMATICS-II (UG21T2204)

Time: 3Hrs.

Max.Marks:70

Date:03.01.2018

Pass Marks:35

NOTE: Attempt any FIVE questions out of 7. All questions carry equal marks. Use of approved type Scientific Calculator is allowed. (5x14=70 Marks)

- 1 a) Find 'α' such that the vectors $2i - j + k$, $i + 2j - 3k$ and $3i + \alpha j + 5k$ are coplanar.
b) A particle moves on the curve $x = 2t^2, y = t^2 - 4t, z = 3t - 5$, where t is the time.
Find the components of velocity and acceleration at time $t = 1$ in the direction $i - 3j + 2k$.
(7+7 marks)
- 2 a) Find the values of a and b, so that the surfaces $5x^2 - 2yz - 9z = 0$ may cut the surface $ax^2 + by^3 = 4$ orthogonally at $(1, -1, 2)$.
b) Evaluate $div F$ and $curl F$ at the point $(1, 2, 3)$ given $F = grad[x^3y + y^3z + z^3x - x^2y^2z^2]$.
(7+7 marks)
- 3 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.
b) A particle moves along the curve $x = t^3 + 1, y = t^2, z = 2t + 3$ where t is the time.
Find the components of its velocity and acceleration at $t = 1$ in the direction $i + j + 3k$.
(7+7 marks)
- 4 Solve the following differential equations.
a) $(1 - x^2) \frac{dy}{dx} - xy = 1$.
b) $(x^3y^2 + xy)dx = dy$.
c) $sec^2y \frac{dy}{dx} + x \tan y = x^3$.
(4+5+5 marks)
- 5 a) Solve $\frac{d^2y}{dx^2} - 3 \frac{dy}{dx} + 2y = xe^{3x} + \sin 2x$.
b) Solve $\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = (1 - e^x)^2$.
(7+7 marks)
- 6 a) Solve by the method of variation of parameters: $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}$.

b) Solve $x^2 \frac{d^2y}{dx^2} - 4x \frac{dy}{dx} + 6y = x^2$.

(7+7 marks)

7 a) Solve $(2x + 3)^2 \frac{d^2y}{dx^2} - (2x + 3) \frac{dy}{dx} - 12y = 6x$.

b) Solve by the method of undetermined coefficients: $\frac{d^2y}{dx^2} + y = 2 \cos x$.

(7+7 marks)
