Indian Maritime University

(A Central Univecrsity, Govt of India)

End Semester Examinations – June 2025

Programme Name: DNS

Semester I
Subject Code: UD11T5101
Subject: Applied Mathematics

Date: 02.06.2025	**Max. Marks: 70**
Time: 3 hours	**Pass Marks: 35**

Note: Section A & B (10+10 = 20 Marks) – are compulsory.
Section C (50 Marks) - Answer any 5 questions from Q16 to Q22

General Instructions:

(i) All Sections (A, B & C) are to be attempted.

(ii) Options, if any, are specified in respective section.

(iii) Scientific Calculator is permitted.

Section A – 10 MCQs (10 X 01 Mark)

1. The sides of the polar triangle are ----------the corresponding angles of its primitive triangle.
(a) Supplements of (b) complements of (c) equals (d) none

2. If $\vec{a}$ is a nonzero vector of magnitude 'a' and λ nonzero scalar, then $\lambda\vec{a}$ is a unit vector if
(a) $\lambda = 1$ (b) $\lambda = -1$ (c) $a = |\lambda|$ (d) $a = \frac{1}{|\lambda|}$

3. Equation of a circle which passes through (3, 6) and touches the axes is
(a) $x^2 + y^2 + 6x + 6y + 3 = 0$ (b) $x^2 + y^2 - 6x - 6y - 9 = 0$
(c) $x^2 + y^2 - 6x - 6y + 9 = 0$ (d) $x^2 + y^2 - 6x + 6y - 3 = 0$

4. In a quadrantal spherical triangle if an angle is less than $90°$,then the opposite side is
(a) Equal to $90°$ (b) Less than $90°$
(c) Greater than $90°$ (d)None of these

5. The value of $(\tan 1° \tan 2° \tan 3° \ldots \tan 89°)$ is
(a) 0 (b) 1 (c) 2 (d) $\frac{1}{2}$

6. If the sum of the circumferences of two circles with radii R_1 and R_2 is equal to the circumference of a circle of radius R, then
(a) $R_1 + R_2 = R$ (b) $R_1 + R_2 > R$ (c) $R_1 + R_2 < R$ (d) None

7. What is the ratio of 1 mm to 1 cm?
(a) 1: 100 (b) 10: 1 (c) 1: 10 (d) 100 :1

8. For the parabola $y^2 = -18x$ the length of latus rectum is,
(a) 8 (b) 4 (c)18 (d) -18

9. Find n if a = 0.75825, b= 0.759 and h = 0.00005.
a) 1.5 b) 15 c) 2.5 d) 25

10. The value of $\int_a^b f(x)dx$, the value of n =
(a) $\frac{b-a}{h}$ (b) $\frac{b+a}{h}$ (c) $\frac{a-b}{n}$ (d)none

Section B: Five Questions of 02 Marks each.

11. The curved surface area of a right circular cylinder of height 14 cm is 88 cm^2. Find the diameter of the base of the cylinder.

12. If sin 3A = cos (A – 26°), where 3A is an acute angle, find the value of A.

13. If the perimeter and the area of a circle are numerically equal, then the radius of the circle is?

14. Find the coordinates of the focus, and length of latus rectum of the parabola $y^2 = 8x$.

15. x varies directly as y, when x = 5, y = 30. Find the constant of variation and equation of variation.

Section C: Answer five out of seven questions. (10 Marks Each)

16. **(2 × 5 = 10 Marks)**

(a) In spherical ΔDEF, if $D = 64^\circ 36/$, $E = 76^\circ 47/$ and $e = 90^\circ$. Calculate f.

(b) In a spherical ΔPZX, calculate angles side p. If $\angle P = 58^\circ 30/$, side $x = 49^\circ 34/$ and side $z = 99^\circ 58/$.

17. **(2 × 5 = 10 Marks)**

(a) If the vectors $-3\hat{\imath} + 4\hat{\jmath} - 2\hat{k}$, $\hat{\imath} + 2\hat{k}$ and $\hat{\imath} - p\hat{\jmath}$ are coplanar, then find the value of p.

(b) Find the volume of the parallelepiped determined by the $\vec{a}, \vec{b}$ and $\vec{c}$, $\vec{a} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k}$, $\vec{b} = -\hat{\imath} + \hat{\jmath} + 2\hat{k}$ and $\vec{c} = 2\hat{\imath} + \hat{\jmath} + 4\hat{k}$

18. **(2 × 5 = 10 Marks)**

(a) Obtain the equation of a circle which passes through the intersection of lines $3x - 2y - 1 = 0$, $4x + y - 27 = 0$ and whose Centre is the point (2, -3).

(b) If the eccentricity of an ellipse is $\frac{5}{8}$ and distance between its foci is 10, then find the latus rectum of the ellipse.

19. **(2 × 5 = 10 Marks)**

(a) A tower stands vertically on the ground. From a point on the ground, which is 15 m away from the foot of the tower, the angle of elevation of the top of the tower is found to 60°. Find the height of the tower.

(b) Prove that: $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$

20. **(2 × 5 = 10 Marks)**

(a) A cone of height 24 cm and radius of base 6 cm is made up of modelling clay. A child reshapes it in the form of a sphere. Find the radius of the sphere.

(b) 15 women finish the work of harvesting a groundnut crop in 8 days. Find the number of women if the same job is to be completed in 6 days.

21. **(2 × 5 = 10 Marks)**

(a) Using Simpson's $\frac{1}{3}rd$ rule, calculate the approximate value of $\int_0^6 \frac{1}{1+x^2} dx$ taking 7 equidistant ordinates.

(b) Using Simpson's $\frac{1}{3}rd$ rule, calculate the approximate value of $\int_0^4 (x^2 + 1)\, dx$ by dividing the interval into 4 equal parts.

22. **(10 Marks)**

Evaluate f (15), given the following table of values:

X:	10	20	30	40	50
Y:	46	66	81	93	101.

(10 marks)

****