

INDIAN MARITIME UNIVERSITY

Time Bound Assignment
DNS Arrear Examinations
September/October 2020

UD11T4101

Applied Mathematics

Date: 21/09/2020

Max Marks: 70

Duration: 2 Hrs

Pass Marks: 35

1. Question No. 1 & 2 are compulsory. Answer any 5 out of the remaining 8 questions.
2. Use of approved scientific calculator is permitted.
3. Graph Sheets to be provided.

1. a. In spherical triangle CDE Calculate angles C, D, E of sides $c = 87^\circ 10', d = 62^\circ 37', e = 100^\circ 10'$.

b. In spherical triangle PAV angle $A = 31^\circ 48'$, angle $V = 90^\circ$ and side $v = 66^\circ$. Calculate sides a , and p .

(2x5 = 10 marks)

2. a. In spherical triangle ABC angle $A = 53^\circ 05'$, $b = 124^\circ 29.3'$, and $C = 55^\circ 48.8'$, Calculate side a .

b. In spherical triangle PQR sides $p = 73^\circ 5'$, angle $q = 90^\circ$ and $r = 79^\circ 12'$. Calculate angles P , and Q .

(2x5=10 marks)

3. a. A particle acted on by constant forces $4\hat{i} + \hat{j} - 3\hat{k}$ and $3\hat{i} + \hat{j} - \hat{k}$ is displaced from the point $\hat{i} + 2\hat{j} + 3\hat{k}$ to the point $5\hat{i} + 4\hat{j} + \hat{k}$. Find the total work done by the forces.

b. Given $A = 2\hat{i} + 2\hat{j} - \hat{k}$, $B = 6\hat{i} - 3\hat{j} + 2\hat{k}$, find an unit vector perpendicular to both \vec{A} & \vec{B} .

(2x5=10 marks)

4. a. Solve the following L.P.P. graphically.

$$\text{Maximize } Z = 3x + 4y$$

$$\text{subject to } 4x + 2y \leq 80$$

$$2x + 5y \leq 180$$

$$x, y \geq 0$$

- b. Solve the following L.P.P. graphically.

$$\text{Maximize } Z = 6000x + 4000y$$

$$\text{subject to } 3x + y \geq 40$$

$$x + 2.5y \geq 22$$

$$x + y \geq \frac{40}{3}$$

$$x, y \geq 0$$

(2x5=10 marks)

5. a. Find the equation of the ellipse in the standard form if the distance between its foci is 6 and eccentricity is $\frac{3}{5}$.

- b. Find the equation of the circle having its centre on $y = 4$ and passing thru' (2, 0), (6, 0)

(2x5=10 marks)

6. a. How many solid spheres, each of diameter 6 cm can be made by melting a solid metal cylinder of height 45 cm and diameter 4 cm.

- b. The length of a hall is 24 m and its width is 16 m. If the lateral surface area of the hall is $\frac{2}{3}rd$ of the sum of the area of the roof and the floor, find its height.

(2x5=10 marks)

7. a. The velocity v of a particle at distance S from a point on the linear path is given by the following table.

SM	0	2.5	5	7.5	10	12.5	15	17.5	20
Vm/sec	16	19	21	22	20	17	13	11	19

Estimate the time taken by the particle to travel the distance of 20 meters using Simpson's $\frac{1}{3}rd$ rule.

- b. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's $\frac{1}{3}rd$ rule taking h as 0.25.

(2x5=10 marks)

8. a. As observed from a fixed point on a bank of a river, the angle of elevation of a temple on the opposite bank has measure 30° . If the height of the temple is 20 m find the width of the river.

- b. 2 Ships are sailing in the sea on the 2 sides of a light house. The angle of elevation of the top of the light house observed from the ships are 30° and 45° respectively. If the light house is 100m high find the distance between the 2 ships.

(2x5=10 marks)

9. a. If x varies as the square root of y and inversely as the square of z and $x = \frac{1}{4}$, $y = 9$, and $z = 2$, find y when $x = 1/27$ and $z = 12$.

- b. The attraction of the earth on a body above its surface varies inversely as the square distance from the centre of the earth. If the earth's radius is 4000 miles and a body weighs 5 kg on its surface, what will the body weigh 1000 miles above the earth's surface?

(2x5=10 marks)

10. a. Find a polynomial $f(x)$ by using Lagrange's formula.

x	0	1	2	5
$f(x)$	2	3	12	147

- b. Use Lagrange's interpolation, to find y when $x = 10$ from the following x and y .

x	5	6	9	11
y	12	13	14	16

(2x5=10 marks)

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