INDIAN MARITIME UNIVERSITY
Time Bound Assignment
DNS Arrear Examinations
September/October 2020
UD11T4101
Applied Mathematics

Date: 21/09/2020 Max Marks: 70

Duration: 3 Hrs Pass Marks: 35

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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.

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

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

(2x5 =10 marks)

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

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

(2x5=10 marks)

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

   b. Given $A = 2\hat{\imath} + 2\hat{\jmath} - \hat{k}$, $B = 6\hat{\imath} - 3\hat{\jmath} + 2\hat{k}$, find an unit vector perpendicular to both $\bar{A}$ & $\tilde{B}$.

(2x5=10 marks)

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

Maximize $Z = 3x + 4y$

subject to $4x + 2y \leq 80$

$2x + 5y \leq 180$

$x, y \geq 0$

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

Maximize $Z = 6000x + 4000y$

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 Lagranges 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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