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INDIAN MARITIME UNIVERSITY
(A Central University Government of India)
END SEMESTER EXAMINATIONS- JUNE/JULY 2019
DIPLOMA IN NAUTICAL SCIENCE
SEMESTER - I
APPLIED MATHEMATICS
(UD11T3101)

Date: 24-06-2019

Max. Marks: 70

Time: 02 hours

Pass Marks: 35

Note: Question no.1 and 2 are compulsory. Answer any 5 out of remaining 8 questions. All question carry equal marks .Use of approved type scientific calculator is permitted. Examination centres to supply 'Graph Sheets' to candidates (if required)

Q.1

(a) In a Spherical triangle ABC , $a = 49^{\circ}09'$, angle $C=71^{\circ}20'$, $b=58^{\circ}23'$. Find side c .

(b) In spherical triangle PXY , right angled at X , side $x=118^{\circ}20'$, angle $Y=24^{\circ}05'$. Find side y and angle P.

(5 + 5 marks)

Q.2

(a) In spherical triangle LMN, $N=81^{\circ}50'$, $m=90^{\circ}$ & $L=119^{\circ}07'$. Find side n and angle M.

(b) In spherical triangle PQR, $Q=74^{\circ}52.3'$, $R=71^{\circ}20'$ and side $p=49^{\circ}08'$. Find angle P.

(5 + 5 marks)

Q.3

(a) If $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}$, $\vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$. Calculate the angle between $2\vec{a} + \vec{b}$ and $\vec{a} + 2\vec{b}$.

(b) Find the area of parallelogram whose adjacent sides are vectors $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 3\hat{j} - 3\hat{k}$.

(5 + 5 marks)

Q.4

(a) Formulate and solve the following LPP by graphical method.

A company manufactures bicycle and tricycles, each of which must be processed through two machines A and B. Machine A has maximum of 120 hours available and machine B has a maximum of 180 hours available. Manufacturing a bicycle requires 6 hours on machine A and 3 hours on machine B. Manufacturing a tricycle requires 4 hours on machine A and 10 hours on machine B.

If profits are Rs.180 for a bicycle and Rs.220 for a tricycle, determine the number of bicycles and tricycles that should be manufactured in order to maximize the profit.

(b) Solve the following LPP graphically

$$\text{Minimize } Z = 40x + 24y$$

$$\text{Subject to } 20x + 50y \geq 4800$$

$$80x + 50y \geq 7200$$

$$X, y \geq 0$$

(5 + 5 marks)

Q.5

(a) Find the equation of the circle which passes through the points (1,0), (0, -6) and (3,4).

(b) Find the equation of ellipse, whose focus is (1,0), $e = \frac{1}{\sqrt{3}}$ and directrix is $x = 3$, using focus directrix property.

(5 + 5 marks)

Q.6

(a) A cylindrical jar of radius 10 cm is filled with water up to a height of 15 cm. 14 spherical balls of radius 3 cm each are immersed in the jar. Find the new level to which water is filled in the jar.

(b) A metal parallelepiped of measures 16 cm × 11 cm × 10 cm was melted to make coins. How many coins were made if the thickness and diameter of each coin was 2 mm and 2 cm respectively?

(5 + 5 marks)

Q.7

(a) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ using Simpson's $\frac{1}{3}$ rd rule taking $h = \frac{1}{4}$

(b) Given the data

X:	1	3	5	7	9	11	13
Y = f(x):	-8	-4	0	4	8	12	16

find y, when $x = 2$

(5 + 5 marks)

Q.8

(a) A pilot in an aeroplane observes that Vashi bridge is on one side of the plane and Worli sea-link is just on the opposite side. The angle of depression of Vashi bridge and Worli sea-link are 60° and 30° respectively. If the aeroplane is at a height of $5500\sqrt{3}$ m at that time, what is the distance between Vashi bridge and Worli sea-link?

(b) Prove that

$$\frac{\tan A}{(1+\tan^2 A)^2} + \frac{\cot A}{(1+\cot^2 A)^2} = \sin A \cdot \cos A$$

(5 + 5 marks)

Q.9

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

(b) The attraction of the earth on a body above its surface varies inversely as the square of its 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?

(5 + 5 miles)

Q.10

(a) If $f(0)=5$, $f(1)=6$, $f(3)=14$, use Lagrange's interpolation formula to find polynomial $f(x)$ passing through $(0,5)$, $(1,6)$, $(3,14)$. Hence estimate $f(2)$.

(b) Find $f(2)$ for the data $f(0)=1$, $f(1)=3$ and $f(3)=55$.

(5 + 5 marks)

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