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 = $49^0 09'$, angle C=$71^0 20'$, b=$58^0 23'$. Find side c .

(b) In spherical triangle PXY , right angled at X , side x=$118^0 20'$, angle Y=$24^0 05'$.Find side y and angle P.

(5 + 5 marks)

Q.2

(a) In spherical triangle LMN, N=$81^0 50'$, m=90^0 & L=$119^0 07'$ .Find side n and angle M.

(b) In spherical triangle PQR, Q=$74^0 52.3'$, R=$71^{0s} 20'$ and side p=$49^0 08'$.Find angle P.

(5 + 5 marks)

Q.3

(a) If $\vec{a} = \hat{\imath} + 2\hat{\jmath} - 3\hat{k}$, $\vec{b} = 3\hat{\imath} - \hat{\jmath} + 2\hat{k}$ .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 $\vec{a} = 2\hat{\imath}-2\hat{\jmath}+\hat{k}$ and $\vec{b}=\hat{\imath}-3\hat{\jmath}-3\hat{k}$.

(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

Minimize $Z = 40x + 24y$

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 parallelopiped of measures 16 cm× 11cm ×10cm was melted to make coins . How many coins were made if the thickness and diameter of each coin was 2mm and 2cm 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

(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 60^0 and 30^0 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

$$\frac{tanA}{(1+tan^2A)^2} + \frac{cotA}{(1+cot^2A)^2} = \text{sinA . cosA}$$

(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)

---------- End ----------