

**INDIAN MARITIME UNIVERSITY**  
(A Central University, Government of India)  
**End Semester Examination Dec 2019/Jan 2020**  
**DNS – DIPLOMA IN NAUTICAL SCIENCE**  
**Semester -I**  
**UD11T3101- APPLIED MATHEMATICS**

**Date: 09.12.2019**

**Max Marks: 70**

**Time: 3 Hours**

**Pass Marks: 28**

**NOTE:** Question No.1 & 2 are compulsory. Answer any 5 out of remaining 8 questions.  
All Questions carry equal marks. (7 Questions x 10 Marks = 70 marks)  
Use of approved type Scientific Calculator is permitted.  
Exam centers to supply graph sheets to candidates if required.

Q 1

- a) In a spherical triangle ABC ,  $a = 39^\circ$  ,  $b = 48^\circ$  and  $C = 74^\circ$ . Find c  
b) In a spherical triangle LMN ,  $N = 81^\circ 50'$  ,  $m = 90^\circ$  and  $L = 119^\circ 07'$  .  
Calculate side l , side n and *angle M*.

Q 2

- a) In a spherical triangle ABC ,  $C = 90^\circ$  ,  $a = 109^\circ 16'$  and  $B = 38^\circ 45'$ . Find b , c and A.  
b) In a spherical triangle PZX , given  $x = 55^\circ 14'$  ,  $P = 54^\circ 01'$  and  $Z = 121^\circ 25'$ . Find X.

Q 3

- a) A force represented by  $5i + k$  is acting at a point  $9i - j + 2k$ . Find it's moment about the point  $3i + 2j + k$ .  
b) Find the values of a for which the vectors  $3i + 2j + 9k$  and  $i + aj + 3k$  are  
i) Perpendicular  
ii) Parallel.

Q 4

- a) Find the equation of circle which touches the X axis and pass through the points  $(1, -2)$  and  $(3, -4)$   
b) Find the equation of an ellipse in standard form whose distance between foci is  $4\sqrt{2}$  and the length of latus rectum is 4.

Q 5

- a) Solve the following linear programming problem graphically  
Min  $Z = 3x + 5y$   
Subject to constraints  
 $x + 2y \leq 200$   
 $x + y \leq 150$   
 $x \leq 60$   
 $x, y \geq 0$   
b) Using Graphical method , Maximize  $Z = 5x + 3y$   
Subject to :  $x + y \leq 2$  ;  $5x + 2y \leq 10$  ;  $3x + 8y \leq 12$  ;  $x, y \geq 0$

Q 6

- a) A solid toy is in the form a hemi sphere surmounted by a right circular cone. The height of cone is 2 centimeter and the diameter of the base of the cone is 4 centimeter. Determine the volume of the toy. If a right circular cylinder circumscribes the toy. Find the difference of the volume of the toy and cylinder (Take  $\pi = 3.14$ )
- b) A cylindrical bucket, 32 cm high and radius of base 18 cm, is filled with sand. This bucket is emptied on the ground and a conical heap of sand is formed. If the height of the conical heap is 24 cm. Find the radius and slant height of the heap.

Q 7

- a) As observed from the top of a 75 meter high light house from the sea level, the angle of depression of two ships  $30^\circ$  and  $45^\circ$ . If one ship is exactly behind the other on the same side of the light house. Find the distance between the ships.
- b) A vertical tower stands on ground and is surmounted by a vertical flagpole of height 18 m. At a point on the ground, the angle of elevation of the bottom and the top of the flagpole are  $30^\circ$  and  $60^\circ$  respectively. What is the height of the tower?

Q 8

- a) Use Simpson's 1/3 rd Rule to find  $\int_0^{0.6} e^{-x^2} dx$  by taking 7 ordinates.
- b) Given that :

x	4.0	4.2	4.4	4.6	4.8	5.0	5.2
logx	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

Evaluate  $\int_4^{5.2} \log x dx$  by Simpson's 3/8 th Rule.

Q 9

- a) If  $y$  varies directly as  $x$  and inversely as  $z$ , and  $y = 5$  when  $x = 2$  and  $z = 4$ , Find  $y$  when  $x = 3$  and  $z = 6$
- b) The intensity of light produced by a light source varies inversely as the square of the distance from the source. If the intensity of the light produced 3 feet from a light source is 750 foot candles, find the intensity of the light produced 5 feet from the same source.

Q 10

- a) If  $f(x)$  is known at the following data points, find  $f(0.5)$  using Newton's forward interpolation formula.

x	0	1	2	3	4
f(x)	1	7	23	55	109

- b) Using Lagrange's formula to find  $f(x)$ , from the following data

x	0	1	3	4
f(x)	21	15	12	10

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