

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – December 2023
Programme Name: DNS
Semester: I
Subject Code: UD11T5101
Subject Name: Applied Mathematics

Date: 15.12.2023

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective section.
- (iii) Use of non-programmable scientific calculator is allowed.

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. The side of a spherical triangle is
 - a. Less than 180°
 - b. Greater than 180°
 - b. Equal to 180°
 - d. Greater than or equal to 180°
2. Measure of the side of a spherical triangle is the
 - a. measure of angle subtended by it at the centre of the sphere.
 - b. measure of angle subtended by it at the surface of the sphere.
 - c. measure of angle subtended by it at its poles.
 - d. measure of angle subtended by it at the opposite vertex of the spherical triangle.
3. For the Parabola $y^2 = 18x$ the length of latus rectum is
 - a. 8
 - b. 4
 - c. 18
 - d. -18
4. The area of circle, centred at (1,2) and passing through (4,6) is
 - a. 5π
 - b. 10π
 - c. 25π
 - d. 35π

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 $\frac{1}{4}$

Part C (Answer any Five out of Seven)
Each Question is for 10 Marks (Each subquestion carry 5 marks)

16. a) In spherical triangle WXY, $W = 88^{\circ}24.5'$, $x=98^{\circ}10'$, $y=100^{\circ}09'$. Find w and X .
 b) In spherical triangle PQR, $PQ=52^{\circ}11'$, $Q=69^{\circ}47'$ and $QR=90^{\circ}$. Calculate PR.
17. a) Find the equation of the standard ellipse whose length of latus rectum =5 and eccentricity = $2/3$.
 b) Find the equation of the circle which passes through the points $(3,7)$, $(5,5)$ and has its centre on the line $x - 4y = 1$.
18. a) A particle is acted on by constant force $F_1=3i+2j+5k$, $F_2 = 2i+j+3k$ and $F_3= i+2j-3k$ and displaced from a point whose position vector is $2i-j-3k$ to a point whose position vector is $4i-3j+7k$. Calculate the work done.
 b) Find the vector whose length is 3 and which is perpendicular to the vector $\vec{a} = 3\hat{i} + \hat{j} - 4\hat{k}$ and $\vec{b} = 6\hat{i} + 5\hat{j} - 2\hat{k}$.
19. a) A copper rod of diameter 1 cm and length 8 cm is drawn into a wire of length 18 m of uniform thickness. Find the thickness of the wire.
 b) Find the area bounded by the curve, from the following table, and The x-axis from $x=7.47$ to $x=7.53$.

x	7.47	7.48	7.49	7.50	7.51	7.52	7.53
f(x)	1.93	1.95	1.98	2.01	2.02	2.06	2.07

20 a) Prove that, $\frac{\cos A}{1 - \tan A} + \frac{\sin A}{1 - \cot A} = \sin A + \cos A$

- b) From a point on the roof of a house ,11 meters high it is observed that the angles of depression of the top and foot of a lamp post are 30° and 60° respectively. What is the height of the lamp post?


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5. If the height of the circular cylinder is 20 cm and the radius of its base is 7 cm. the volume of cylinder is

- a. 8880 cm^3
c. 3080 cm^3

- b. 8030 cm^3
d. 8080 cm^3

6. A cube A has side thrice as long as that of cube B. Then the ratio of the volume of cube A to that of cube B is,

a. 1:3

b. 27:1

c. 1:27

d. 3:1

7. If y varies directly as x and $y = 10$ when $x = 7$, then the constant of proportionality is,

a. $7/5$

b. $1/10$

c. $7/10$

d. $10/7$

8. Newton's forward interpolation formula can be used for,

a. equal intervals

b. unequal intervals

c. Both equal and unequal intervals

d. None of these

9. From a distance of 150 feet from the foot of the vertical flagstaff the angle of elevation to the top is found to be 30° , the height of the flagstaff in feet is

a. 259.81

b. 86.60

c. 75

d. 300

10. The scalar product of the vectors $5\hat{i} + 3\hat{j} - 3\hat{k}$ and $3\hat{i} - 4\hat{j} + 7\hat{k}$ is

a. 15

b. -15

c. 10

d. -18

Section B

5 Short answer questions (02 Mark Each)

11) Find the component of force $\vec{f} = 4\hat{i} + \hat{j} - 3\hat{k}$ along the vector $2\hat{i} - \hat{j} - 2\hat{k}$.

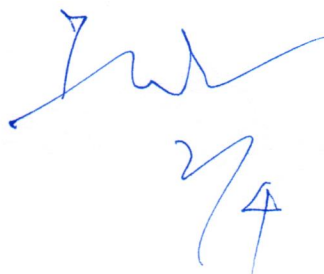
12) In a spherical triangle PQR, side $p = 73^\circ 5'$, side $q = 90^\circ$ and side $r = 79^\circ 12'$

Calculate angle P.

13) The height and the slant height of a cone are 21 cm and 28 cm respectively. Find the volume of the cone.

14) A machine in a soft drink factory fills 840 bottles in six hours. How many bottles will it fill in five hours?

15) State the Supplemental Theorem of polar triangle.



21. a) Evaluate $\int_{-3}^3 x^4 dx$ using Simpson's 3/8th rule.

b) From the given data estimate $f(3)$ by using Lagrange's interpolation formula: $f(0) = 2$, $f(1) = 3$, $f(2) = 12$, $f(5) = 147$

22. a) The volume of sphere varies directly as the cube of its radius.

The volume of the sphere is 36 cm^3 when the radius is 3 cm.

Find the volume of the sphere when the radius is 5 cm.

b) In spherical triangle PVM, side $v = 92^\circ$, side $m = 51^\circ 55'$ and angle $V = 90^\circ$. Find side p and angle P .

Jan
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