

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations – June 2024
Programme Name: DNS
Semester: 1
Subject Code: UD11T5101
Subject Name: APPLIED MATHEMATICS

Date: 27.05.2024

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) Tables (Steam/Log/Nautical Almanac etc) that can be used.
- (iv) Chart Work Booklets to be used.
- (v) Any other tables/charts to be used.

Section A

Ten MCQs of 01 Mark each – Choose the correct answer as applicable.

1. In a spherical triangle, vertically opposite angles are
 (a) Unequal (b) Equal (c) Grater (d) Smaller
2. The sum of any two sides of a spherical is than the third side.
 (a) Greater (b) Smaller (c) Equal (d) None.
3. The length of the latus rectum of the ellipse $3x^2 + y^2 = 12$
 (a) 4 (b) 3 (c) 8 (d) $\frac{4}{\sqrt{3}}$
4. For the parabola $x^2 = 17y$ the length of latus rectum is
 (a) 17 (b) $\frac{17}{4}$ (c) $\frac{17}{2}$ (d) -17
5. If the surface area of a sphere is $144\pi \text{ cm}^2$, then its radius is:
 (a) 6 (b) 8 cm (c) 12 cm (d) 10.
6. A solid sphere of radius V is melted and recast into the shape of a solid cone of height V, then the radius of the base of the cone is:
 (a) V (b) 2V (c) V^2 (d) 3V.
7. If 15 workers can build a wall in 48 hours, how many workers will be required to do the same work in 30 hours?
 (a) 24 (b) 12 (c) 6 (d) 3.

8. Simpson's Rule and Trapezoidal Rule use to find
 (a) Area. (b) Volume (c) Both (d) None of these
9. If the length of the shadow of a tree is decreasing, then the angle of elevation is:
 (a) Increasing (b) Decreasing (c) Remains the same (d) None.
10. Let \vec{a} and \vec{b} be such that $|\vec{a}| = 3$ and $|\vec{b}| = \frac{\sqrt{2}}{3}$, then $\vec{a} \times \vec{b}$ is a unit vector, if the angle between \vec{a} and \vec{b} is
 (a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

Section B

Five Questions of 02 Marks each

11. Find unit vector in the direction of vector $\vec{a} = 2\hat{i} + 3\hat{j} + \hat{k}$
12. In a spherical triangle DEF, $D = 49^\circ 27'$, $d = 49^\circ 34'$ and $F = 100^\circ 29'$. Use Sine formula to calculate side f.
13. If the volume of a right circular cone of height 9 cm is $48\pi \text{ cm}^3$, find the diameter of its base.
14. If x varies inversely as y and when $x = 6$, $y = 8$, then for $x = 8$ find value of y.
15. Write both Napier's formula with example.

Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.

16. (a) In a spherical $\triangle ABC$, calculate angles A, and B. If $a = 49^\circ 08'$, $b = 58^\circ 23'$ and $C = 71^\circ 20'$.
 (b) In spherical $\triangle LMN$, if $M = 44^\circ 16'$, $m = 39^\circ 37'$ and $L = 90^\circ$ Calculate side l, n, and N.
17. (a) If the equations of the two diameters of a circle are $x - y = 5$ and $2x + y = 4$ and the radius of the circle is 5, find the equation of the circle.
 (b) Find the equation of the parabola which is symmetric about the y-axis, and passes through the point (2, -3).
18. (a) If \vec{a} is a unit vector and $(\vec{x} - \vec{a}) \cdot (\vec{x} + \vec{a}) = 8$, then find $|\vec{x}|$.
 (b) Find the moment of the force (torque) about the points $2\hat{i} + \hat{j} - \hat{k}$ of a force represented by $4\hat{i} + \hat{k}$ acting through the point $\hat{i} - \hat{j} + 2\hat{k}$.
19. (a) Rainwater which falls on a flat rectangular surface of length 6 m and breadth 4 m is transferred into a cylindrical vessel of internal radius 20 cm. What will be the height of water in the cylindrical vessel if the rain fall is 1 cm. Give your answer to the nearest integer. (Take $\pi = 3.14$).

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(b) Evaluate $\int_3^8 \log x \, dx$

Using Trapezoidal rule, given that.

x	3	4	5	6	7	8
F(x)	1.0986	1.3863	1.6094	1.7918	1.9456	2.0794

20. (a) If $y = (1 + \tan A)(1 - \tan B)$, where $A - B = \frac{\pi}{4}$, then prove $(y + 1)^{y+1} = 27$.

(b) A vertical tower stands on a horizontal plane and is surmounted by a vertical flag staff of height h . At a point on the plane, the angles of elevation of the bottom and the top of the flag staff are α and β , respectively. Prove that the height of the tower is $\frac{h \tan \alpha}{\tan \beta - \tan \alpha}$.

21. (a) Evaluate $\int_0^4 (x^2 + 1) \, dx$, Using Simpson's $\frac{1}{3}rd$ rule by dividing the interval in to 4 equals parts.

(b) Evaluate $f(15)$, given the following table of values:

X:	10	20	30	40	50
Y = f(x):	46	66	81	93	101

22. (a) A vehicle running at a speed of 48 km/hr. takes 6 hours to complete the journey. How much time will be taken to complete the journey if its speed is 72 km/hr.?

(b) Suppose x varies jointly with y and the square root of z . When $x = -18$ and $y = 2$, then $z = 9$. Find y .

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Training Section IMU NMC <trgsection.imunavimumbai@imu.ac.in>

Fwd: Clarification - UD11T5101 - 27.05.2024 AN - reg.

1 message

Capt A K Majumder IMU Navi Mumbai Campus <majumderak@imu.ac.in>
To: Training Section IMU NMC <trgsection.imunavimumbai@imu.ac.in>

Mon, May 27, 2024 at 3:18 PM

Capt. A. K. Majumder, (HoD i/c)
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----- Forwarded message -----

From: **ESE IMU HQ** <imuese@imu.ac.in>
Date: Mon, May 27, 2024 at 3:16 PM
Subject: Clarification - UD11T5101 - 27.05.2024 AN - reg.
To:

Sir/Madam,

1. Please refer to today's QP Code UD11T5101.
2. In this regard, please read Q No 22 (b) under Section C as follows:

22(b) Suppose x varies jointly with y and the square root of z . When $x = -18$ and $y = 2$, then $z = 9$. Find y when $x = 10$ & $z = 4$.

3. Kindly disseminate the same to the concerned students.

Thanks & Regards,

Cmde KD Joshi (IN) (Retd)
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