

Indian Maritime University
(A Central University, Govt of India)
Supplementary Examinations – March/April 2025

Programme Name: B Sc (NS)

Semester: 1

Subject Code: UG21T6102

Subject Name: Mathematics

Date: 04.03.2025

Duration: 03 Hrs

Max Marks: 70

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) Scientific Calculator is permitted

Section A

CHOOSE THE CORRECT ANSWER/FILL IN THE BLANKS

(1 Marks Each)

- 1) $\frac{\sin 2A}{1+\cos 2A} \cdot \frac{\cos 2A}{1+\cos A} =$
a) $\tan \frac{A}{2}$ b) $\cot \frac{A}{2}$ c) $\sec \frac{A}{2}$ d) $\operatorname{cosec} \frac{A}{2}$
- 2) Sum of the three angles of a spherical triangle lies between _____
& _____
a) 0° & 180° b) 0° & 360° c) 180° & 540° d) 360° & 540°
- 3) If a circle whose centre is $(1, -3)$ touches the line $3x-4y=5$ then the radius of the circle is
a) 4 b) 2 c) $\frac{5}{2}$ d) $\frac{7}{2}$
- 4) The surface area of two spheres are in the ratio 1:2. The ratio of their volume is
a) $\sqrt{2}:1$ b) $1:2\sqrt{2}$ c) 1:8 d) 1:4
- 5) The standard deviation of 5 scores 1,2,3,4,5 is
a) $\frac{2}{5}$ b) $\frac{3}{5}$ c) $\sqrt{2}$ d) $\sqrt{3}$
- 6) Two die are thrown simultaneously. What is the probability of obtaining sum of the numbers less than 11?
a) $\frac{17}{18}$ b) $\frac{11}{12}$ c) $\frac{1}{12}$ d) none of these

1/3

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7) $\Delta(\log x) =$

- a) $\log\left(\frac{x+h}{x}\right)$ b) $\log\left(\frac{x}{x+h}\right)$ c) $\log(x+h)$ d) $\log x$

8) Simpson's $\frac{1^{rd}}{3}$ rule is applicable when number of equal subintervals(n) is

- a) odd numbers b) even numbers
c) even or odd d) none of these

9) If $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}$, $\vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$ then the angle between the vectors $\vec{a} + \vec{b}$ & $\vec{a} - \vec{b}$ is

- a) 30° b) 45° c) 60° d) 90°

10) State Lagrange's interpolation formula.

Section B
SHORT ANSWER TYPE QUESTIONS
(2 Marks Each)

11) In a spherical triangle LMN, $M=33^\circ 14'$, $m=80^\circ 5'$, $n=70^\circ 12'$. Calculate N using sine formula.

12) Find the coordinates of focus & equation of directrix of the parabola $5y^2 = 24x$.

13) Find the coefficient of variation of a sample which has mean equal to 25 & standard deviation of 5.

14) Construct forward difference table for $y = x^2 + x + 1$ taking $x=0,1,2,3,4$.

15) If $P(E) = 0.4$, $P(F) = 0.35$ & $P(E \cup F) = 0.55$ find $P(E/F)$.

Section C
ANSWER FIVE OUT OF SEVEN QUESTIONS.
(10 Marks Each)

16 a) Prove that $\frac{\sec 8A - 1}{\sec 4A - 1} = \frac{\tan 8A}{\tan 2A}$ (5 Marks)

16 b) A vertical pole and a vertical tower are on the same level ground. From the top of the pole the angle of elevation of the top of the tower is 60° and the angle of depression of the foot of the tower is 30° . Find the height of the tower if the height of the pole is 20 m. (5 Marks)

17 a) In a spherical triangle ABC, $a = 49^\circ 08'$, $b = 58^\circ 23'$, $C = 71^\circ 20'$. Calculate side c.

(5 Marks)

17 b) In a spherical triangle RST, $t = 80^{\circ}32'$, $r = 60^{\circ}40'$, $T = 90^{\circ}$.

Calculate angle S & angle R.

(5 Marks)

18 a) Find the equation of the ellipse in standard form if, the length of major axis is

10 & the distance between foci is 8.

(5 Marks)

18 b) A copper rod of diameter 1cm & length 8cm is drawn into a wire of length 18 m

of uniform thickness. Find the thickness of the wire.

(5 Marks)

19 Find the mean & standard deviation of the following given data:

(10 Marks)

Groups	Frequency
0-10	14
10-20	13
20-30	27
30-40	21
40-50	15

20 a) Estimate $f(8)$ by Newton's forward difference formula from the following data:

x	5	10	15	20
$f(x)$	50	70	100	145

(5 Marks)

20 b) Evaluate $\int_0^4 (x^2 + 1). dx$ using Simpson's $\frac{1^{rd}}{3}$ rule by dividing the interval [0,4]

into 4 equal parts.

(5 Marks)

21 a) Find the projection of $\vec{a} = \hat{i} - 2\hat{j} + \hat{k}$ on the vector $\vec{b} = 4\hat{i} - 4\hat{j} + 7\hat{k}$.

(5 Marks)

21 b) A rescue team is trying to locate a lost ship, which could be in either Area A

or Area B. From past data, the probability that a lost ship is in Area A is 60%,

and the probability that it is in Area B is 40%. A surveillance plane is sent to

look for the ship, and it has a 75% chance of detecting a ship if it is in Area A,

and a 50% chance of detecting it if it is in Area B.

If the plane detects a ship, what is the probability that the ship is in Area A? (5 Marks)

22 a) In a spherical triangle PQR, $PQ = 52^{\circ}11'$, $Q = 69^{\circ}47'$ & $QR = 90^{\circ}$. Calculate

P, R & PR.

(7 Marks)

22 b) State Newton's backward difference interpolation formula.

(3 Marks)