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 **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) 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) $cosec\frac{A}{2}$

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

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 $\frac{1}{3}^{rd}$ 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 $\vec{a} = \hat{\imath} + 2\hat{\jmath} - 3\,\hat{k}$, $\vec{b} = 3\hat{\imath} - \hat{\jmath} + 2\,\hat{k}$ 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°14′, m=80°5′, n=70°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, $a = 49°08', b = 58°\,23',\ C = 71°20'$. Calculate side c.

(5 Marks)

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

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 $\frac{1}{3}^{rd}$ rule by dividing the interval $[0,4]$ into 4 equal parts. (5 Marks)

21 a) Find the projection of $\bar{a} = \hat{\imath} - 2\hat{\jmath} + \hat{k}$ on the vector $\bar{b} = 4\hat{\imath} - 4\hat{\jmath} + 7\hat{k}$. (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, $PQ = 52°11',\ Q = 69°47'$ & $QR = 90°$. Calculate P,R & PR. (7 Marks)

22 b) State Newton's backward difference interpolation formula. (3 Marks)