Indian Maritime University

(A Central Uni4versity, Govt of India)

End Semester Examinations – June 2025

Programme Name: B Sc (NS)

Semester: II

Subject Code: UG21T6201

Subject Name: NAUTICAL MATHEMATICS

Date: 03.06.2025	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) Use of Non programmable scientific calculator is allowed.

Section A

Ten MCQs/Fill in the Blanks – Choose the correct answer as applicable.
Answer all ten question (10 x 1 mark = 10 marks)

1. The angle of a polar triangle is _____ to the corresponding side of its primitive triangle.
   A. Complement
   B. Supplement
   C. Congruent
   D. None of these

2. Which trigonometric concept is often used to solve right-angled and quadrantal spherical triangles?
   A. Sine, cosine, and tangent
   B. Haversine formula
   C. Polar triangles
   D. Napier's rules

3. Which Probability distribution has same mean, median and mode
   A. Binomial
   B. Poisson
   C. Normal
   D. Geometric

4.The rank corelation coefficient between the variable is denoted by

A. $\rho = 1 - \frac{6\sum di^2}{n^3-n}$

B. $\rho = 1 - \frac{6\sum di^2}{n^2-n}$

C. $\rho = 1 - \frac{3\sum di^2}{n^3-n}$

D. $\rho = 1 - \frac{6\sum di^2}{n^3}$

5.A square matrix is symmetric if_____

A. $A=A^T$

B. $A=A^{-1}$

C. A=I

D. A=adj of A

6. What is the role of Eigen value in a Linear Transformation

A. Determine the Direction of linear Transformation

B. Scaling factor among Eigen vectors

C. Determine rotation of angle

D. None.

7.For sets A = {x | x is an integer, $1 \leq x \leq 6$} and
B = {x | x is an even integer, $2 \leq x \leq 8$}, find the
set A - B.=_____ (fill up the blank)

8. If the final column of the truth table for a compound statement consists entirely of true (T) values, the statement is a _____(fill up the blank)

9. Region represented by $x \geq 0$, $y \geq 0$ is:

A. first quadrant

B. second quadrant

C. third quadrant

D. fourth quadrant

10. The objective function of a linear programming problem is:

A. a constraint

B. function to be optimised

C. A relation between the variables

D. None of these

Section B

Answer all Five Questions (5 x 2marks = 10 marks)

11. State the Supplemental Theorem.

12. A random variable X has the following probability function:

x:	0	1	2	3	4	5	6	7
P(x):	0	k	2k	2k	3k	K^2	$2K^2$	$7K^2+k$

i) Find the value of the k
ii) P(0<X<5)

13. Find the rank of matrix by reducing to echelon form $A=\begin{bmatrix}5 & 3 & 14 & 4\\ 0 & 1 & 2 & 1\\ 1 & -1 & 2 & 0\end{bmatrix}$

14. For sets E = {1, 3, 5, 7, 9} and F = {0, 1, 2, 3, 4}, find the set E ∪ F and the set E - F.

15. A furniture dealer deals in only tables and chairs. He can invest up to Rs. 50,000 only and has a storage capacity of 100 pieces. His cost price of a table is Rs. 1200 and of a chair is Rs. 500. He can earn profit of Rs. 180 on the sale of the table and Rs. 75 on the sale of one chair. Assuming that he can sell all the items he buys, formulate a LPP so that he can maximize the profit

Section C

Answer any five out of Seven Questions. (5 x 10 marks =50 marks)

16. In spherical triangle PQR, P = $57^0 30.5'$, Q = $95^0\ 17'$, R = $70^0\ 11'$.

Calculate p, q, and r. (10)

17.a) Calculate the rank correlation coefficient from the following data showing ranks of 10 students in two subjects. (05)

Maths	3	8	9	2	7	10	4	6	1	5
Physics	5	9	10	1	8	7	3	4	2	6

b) The probability that a pen manufactured by a company will be defective is 1/10 . If 12 such pens are manufactured, find the probability that
(i) exactly two will be defective
(ii) At least two is defective
(iii) None will be defective (05)

18.a) Test the following system of equations for consistency and if consistent solve
x+2y+z=3: 2x+3y+2z=5 ; 3x-5y+5z=2 ; 3x+9y-z=4 (05)

b) Find the eigen values and eigen vectors of the matrix $A=\begin{bmatrix}2 & 2 & 1\\ 1 & 3 & 1\\ 1 & 2 & 2\end{bmatrix}$ (05)

19. a) Construct the truth tables for (a) $p \wedge \sim q$ (b) $(p \vee q) \vee \sim p$ (05)

b) Find AUB, A∩B and AXB , where

$A=\frac{0.9}{1}+\frac{0.7}{3}+\frac{0.2}{4}+\frac{0.3}{6}$

$B=\frac{0.1}{2}+\frac{0.4}{3}+\frac{0.5}{4}+\frac{0.8}{5}$

are defined on the universe U= {1,2,3,4,5,6} (05)

20.a) Graphically find the maximum value of z= 40x+60y
subject to $2x+3y \leq 60$
$4x+3y \leq 96$,
$x, y \geq 0$ (05)

b) A company manufactures two types of cloth, using three different colours of wool. One yard length of type a cloth requires 4 ox of red wool, 5 oz of green wool and 3 oz of yellow wood. One yard length of type B cloth requires 5 oz of red wool, 2 oz of green wool and 8 oz of yellow wool. The wool available for manufacturer is 1000 oz of red wool, 1000 oz of green wool and 1200 oz of yellow wool. The manufacturer can make a profit of Rs. 5 on yard of type A cloth and Rs. 3 on one yard of type B cloth. Find the Best combination of the quantities of type A and type B cloth which gives him maximum profit by solving the L.P.P graphically. (05)

21.a) The following table gives the data of rainfall and discharge in a certain river. Obtain the line of regression of y on x. (06)

Rain fall:	1.5	1.8	2.6	2.9	3.4
Discharge:	33	36	40	46	53

b) Solve the simultaneous equations using Cramer's rule (04)

x+2y+3z=-5 : 3x+y-3z=4 : -3x+4y+7z=-7

22.a) Show that $(P \rightarrow Q) V (Q \rightarrow P)$ is a tautology. (05)

b) What is the simple interest for five years on a principal amount of 5600/- if the rate of interest for the first 3 years is 10% per annum and rate of interest for another 2 years is 20% per annum. (05)
