

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)

June 2017 End Semester Examinations
Diploma in Nautical Science – First Semester

(Applied Mathematics– UD11T 2101)
(Aug' 2012 to Feb' 2015 batches only)

Date: 15.06.2017

Maximum Marks : 70

Time: 2 Hrs

Pass Marks : 25

NOTE: Attempt any FIVE questions out of 7. All questions carry equal marks.
Use of non programmable type Scientific Calculator is allowed.

1 a) Find the constant ' λ ' so that the two vectors $\vec{a} = i + (2\lambda - 1)j + 3k$ and $\vec{b} = -3i + 2j - \lambda k$ are perpendicular.

b) If $\vec{a} = i + 2j - 3k$ and $\vec{b} = 3i - j + 2k$. Calculate the angle between $2\vec{a} + \vec{b}$ and $\vec{a} + 2\vec{b}$. (7+7 marks)

2 a) Three urns A,B,C contain 6 red and 4 black balls, 2 red and 6 black balls and 1 red and 8 black balls respectively. An urn is chosen at random and a ball is drawn from the urn. If the ball drawn is red, find the probability that the ball was drawn from urn A.

b) Calculate the Karl-Pearson's coefficient of correlation from the following data:

x	105	104	102	101	100	99	98	96	93	92
y	101	103	100	98	95	96	104	92	97	94

(7+7 marks)

3 a) Find the equation of the circle with centre at (1,-2) and touching the line

$$4x - 3y + 5 = 0.$$

b) Find the equation of the standard ellipse whose length of latus rectum is 5 and eccentricity is $\frac{2}{3}$. (7+7 marks)

4 a) A cylindrical bucket, 32 cm high and radius of base 18 cm, is filled with sand. This bucket is emptied on the ground and a conical heap of sand is formed. If the height of the conical heap is 24 cm, find the radius and slant height of the heap.

b) Evaluate $\int_{-3}^3 x^4 dx$ using Simpson's $\left(\frac{3}{8}\right)^{th}$ rule. (7+7 marks)

5 a) Two ships are sailing in the sea on the two sides of a lighthouse. The angle of elevation of the top of the lighthouse is observed from the ships are 30° and 45° respectively. If the lighthouse is 100 m high, find the distance between two ships.

b) From a point on the roof of a house, 11 metres 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? (7+7 marks)

6 a) In a spherical triangle PAB , $A = 111^\circ 58'$, $B = 101^\circ 31'$, $P = 90^\circ$. Find a and p .

b) In a spherical triangle PZX , $P = 50^\circ$, $z = 70^\circ 45'$, $x = 62^\circ 10'$. Find p .

(7+7 marks)

7 a) The number of days required to read a book is inversely proportional to the number of pages read daily. When 15 pages are read daily, the book can be finished in 32 days. Find the number of days required to finish the reading of the book when 30 pages are read daily.

b) From the given data, estimate $f(3)$ by using Lagrange's interpolation formula:

$$f(0) = 2, f(1) = 3, f(2) = 12, f(5) = 147.$$

(7+7 marks)
