INDIAN MARITIME UNIVERSITY

(A Central University, Govt. of India**)**

May/June 2018 End Semester Examinations

DNS (Diploma in Nautical Science)

Semester I

Applied Mathematics (UD11T2101)

Date: 04.06.2018 **Max.Marks: 70**

Time: 2 Hrs **Pass Marks: 28**

Attempt any five questions out of seven. All questions carry equalmarks. Use of non programmable type Scientific Calculator is allowed.

Marks: 5 x 14 =70

1. a. Find the constant 'λ' so that the two vectors

   $\bar{a} = i + (2\lambda - 1)j + 3k$ and $\bar{b} = -3i + 2j - \lambda k$ are perpendicular.

   b. If $\bar{a} = i + 2j - 3k$ and $\bar{b} = 3i - j + 2k$. Calculate the angle between $2\bar{a} + \bar{b}$ and $\bar{a} + 2\bar{b}$.

(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 bal drawn is red, find the probability that the ball was drawn from urn A.

   b. Calculate the rank correlation coefficient from the following data:

x	1	6	5	10	3	2	4	9	7	8
y	6	4	9	8	1	2	3	10	5	7

(7+7 marks)

3. a. Find the equation of the circle passing through $(-2, 1)$ and $(1, -2)$

and having its centre on $+y + 3 = 0$.

b. Find the equation of the standard ellipse whose length of the 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 $\int_0^1 \frac{dx}{1+x^2}$ using Simpsons $\frac{1}{3}$rd rule taking $h = 0.25$.

(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 meters 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 spherical triangle PQR, angle $P = 53°5'$, sides $PQ = 70°20'$ and $PR = 110°14'$. Calculate angle Q.

   b. In spherical triangle PVM sides $PM = 92°$, $PV = 51°55'$ and angle $V = 90°$. Calculate angle M

(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)

****