# INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

**End Semester Examination Dec 2019/Jan 2020**

**DNS – DIPLOMA IN NAUTICAL SCIENCE**

**Semester -I**

**UD11T2101- APPLIED MATHEMATICS**

**Date: 09.12.2019** **Max Marks: 70**

**Time: 2Hours** **Pass Marks: 25**

Note: Five questions out of seven to be attempted. All questions carry equal marks. Calculator is allowed.

Q.1 a) Find the unit vector in the direction of the vector $2\hat{i}+3\hat{j}-2\hat{k}$ (07)

b) If $\bar{a}=2\hat{i}+2\hat{j}+\hat{k},\ \bar{b}=-\hat{i}+2\hat{j}+3\hat{k}$ , then Find

(i) $\bar{a}\,.\bar{b}$ (ii) angle between $\bar{a}\ and\ \bar{b}$ (07)

Q.2 a) A factory has two Machines-I and II. Machine-I produces 60% of items and Machine-II produces 40% of the items of the total output. Further 2% of the items produced by Machine-I are defective whereas 4% produced by Machine-II are defective. If an item is chosen and is found to be defective, what is the probability that it is from the Machine –I. (07)

(b) Ten participants in a contest are ranked by two judges as follows:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| X: | 1 | 6 | 5 | 10 | 3 | 2 | 4 | 9 | 7 | 8 |
| Y: | 6 | 4 | 9 | 8 | 1 | 2 | 3 | 10 | 5 | 7 |

Calculate the rank correlation coefficient. (07)

Q.3 a) Determine the equation of a circle if its center is (8,-6) and it passes through the point (5,-2). (07)

b) Find the centre , the lengths of the axes, eccentricity and the foci of the ellipse $\frac{(x-2)^2}{9}+\frac{(y+3)^2}{9/4}=1$ (07)

Q.4 a) A solid toy in the form a hemisphere surmounted by a right circular cone. The height of cone is 2 cm and the diameter of the base of the cone is 4 cm. Determine the volume of the toy. (07)

b) Using the data given below evaluate $\int_0^{60} ydx$ by Simpson's 1/3 rd rule.

| X | 0 | 10 | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|---|---|
| Y | 30 | 31.63 | 33.44 | 35.47 | 37.75 | 40.33 | 43.25 |

(07)

Q.5 a) As observed from a fixed point on a bank of a river, the angle of elevation of a temple on the opposite bank has measure $30^0$. If the height of the temple is 20 m, find the width of the river. (07)

b) Two ships are sailing in the sea on the two sides of a light house. The angle of elevation of the top of the light house is observed from the ships are $30^0$ and $45^0$ respectively. If the light house is 100 m high, find the distance between the two ships. (07)

Q.6 a) In spherical triangle PQR, p = $62^0$ 10.1', q =$111^0$ 35.2', r = $63^0$ 33'. Calculate P. (07)

b) In spherical triangle PZX, right angled at Z, p = $110^0$ 20' and z = $84^0$ 12'. Find the value of P, and x. (07)

Q.7 a) The weight of an object above Earth varies inversely as the square of its distance from the center of Earth. If an astronaut in a space vehicle weighs 57 pounds when 6700 miles from the center of Earth, what does the astronaut weigh when 4090 miles from the center? (07)

b) Find f(2) for the data f(0) = 1, f(1) = 3 and f(3) = 55. using Lagrange's interpolation formula . (07)

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