No. of Printed Pages : 3

BNA-011

B.Sc. (NAUTICAL SCIENCE)

Term-End Examination

June, 2015

00035

BNA-011 : APPLIED MATHEMATICS

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any* ***five*** *questions. Use of scientific calculator is allowed.*

1. (a) If $\vec{a} = i + j$ and $\vec{b} = j - k$, find the angle between $(\vec{a} + \vec{b})$ and $(\vec{a} - \vec{b})$. *4*

(b) If the vectors $\hat{i} + x\hat{j} - 2\hat{k}$ and $x\hat{i} + 3\hat{j} - 4\hat{k}$ are mutually perpendicular, then find 'x'. *3*

(c) By using Simpson's 1/3rd Rule, evaluate $\int_0^2 (1 + x^4)dx$ dividing [0, 2] in 4 equal sub-intervals. *7*

2. (a) The chances of X, Y, Z becoming managers of a certain company are 4 : 2 : 3. The probabilities that bonus scheme will be introduced, if X, Y, Z become managers are 0·3, 0·5 and 0·8 respectively. If the bonus scheme is introduced, what is the probability that X is appointed as the manager ? 7

(b) The following table gives age of the cars of a certain make and annual maintenance costs. Obtain Regression equation for costs related to age : 7

Age of cars (in years)	2	4	6	8
Maintenance cost (in ₹)	10	20	25	30

3. (a) If $x = a \cos^3 \theta$ and $y = a \sin^3 \theta$, find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{3}$. 7

(b) If $y = \log (\log 2x)$, then show that : 7

$$x\frac{d^2y}{dx^2} + \frac{dy}{dx} + x\left(\frac{dy}{dx}\right)^2 = 0$$

4. (a) Evaluate $\int \frac{e^x (1+x)}{\cos^2 (x.e^x)} dx$. 7

(b) Using Integration, find the area of region bounded by the curve $xy = 3$, x-axis and the lines $x = 1$, $x = 4$. 7

5. (a) In a spherical triangle PQR, $P = 57° 30·5'$, $Q = 95° 17'$ and $R = 70° 11'$. Calculate the side p. 7

(b) In spherical triangle NBC, $N = 40° 44'$, $n = 36° 13'$ and $C = 90°$. Find the sides b, c and angle B. 7

6. (a) Find the equation of ellipse, if x-axis and y-axis are its axes and whose foci are $(\pm 1, 0)$ and eccentricity is $\frac{1}{\sqrt{3}}$. 7

(b) Find the equation of circle with centre $(3, -1)$ and which cuts off an intercept of 6 units on the line $2x - 5y + 18 = 0$. 7