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BNA-011

B.Sc. (NAUTICAL SCIENCE)

00310

Term-End Examination

December, 2010

BNA-011 : APPLIED MATHEMATICS

Time : 2 hours *Maximum Marks : 70*

Note : (i) Attempt any five questions.

(ii) Use of calculator is permitted.

1. (a) Vectors a and b are given by $\mathbf{a} = 3\hat{i} - 2\hat{j} + \hat{k}$ and $\mathbf{b} = -2\hat{i} + 2\hat{j} + 4\hat{k}$. Find projection of the vector $\left(\mathbf{a} + \frac{\mathbf{b}}{2}\right)$ onto a. 7

(b) A solid of revolution is formed by rotating about the x-axis, the area between the x-axis, the lines x=0 and x=1 and a curve through the points (0, 2), (1, 3), (2, 4), (3, 6), (4, 5). Estimate the volume of the solid formed using Simpson's $\frac{1}{3}$ rule. 7

2. (a) Find the line of regression of y on x from the data given below : 7

x :	25	28	35	32	31	36	29	38	34	32
y :	43	46	49	41	36	32	31	30	33	39

Also estimate the value of y when x=30.

(b) A committee of four has to be formed from among 3 economists, 4 engineers, 2 statisticians and 1 doctor. 7

(i) What is the probability that each of the four professions is represented on the committee?

(ii) What is the probability that the committee consists of the doctor and at least one economist ?

3. (a) Differentiate $y = (\sin x)^x$ w.r.t. x. 7

(b) A balloon which remains spherical has a diameter $\frac{3}{2}(2x+3)$. Determine the rate of change of volume w.r.t. x. 7

4. (a) Evaluate the integral $\int \frac{5x-1}{x^2-1} dx$ 7

(b) Draw a rough sketch of the curve $y = \sqrt{3x+4}$ and find the area under the curve, above the x-axis and between $x=0$ and $x=4$. 7

5. (a) In spherical triangle PQR, side p = 62°10′, side q=111°35.2′, side r=63°33′. Calculate angle P. 7

(b) In spherical triangle PQR angle P = 57°30.5′, angle Q=95°17′ and angle R=70°11′. Calculate side p, side q and side r. 7

6. (a) Find the equation of the ellipse whose focus is $(-2, 3)$, the directrix is $2x+3y+4=0$ and the eccentricity is $\frac{4}{5}$. 7

(b) Find the equation to the circle which touches the axis of y at a distance +4 from the origin and cuts off an intercept 6 from the axis of x. 7