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

June 2016 End Semester Examinations
B.Sc. (Nautical Science) - 2013 batch onwards
Semester I

NAUTICAL MATHEMATICS - I (UG21T2103)

Date :14.06.2016/A.N **Maximum Marks: 70**
Time: 3 Hrs **Pass Marks : 35**

NOTE: Attempt any SEVEN questions. All questions carry equal marks **7x10=70**
Use of Scientific Calculator is allowed.

1. a. Evaluate the integral $\int_0^3 \int_1^{\sqrt{4-y}} (x+y)\, dx\, dy$ by changing the order of integration.

   b. Find the area lying between the parabola $y = x^2$ and the line $x + y = 0$

2. a. Evaluate $\int\int xy(x+y)dxdy$ over the area between $y = x^2$ and $y = x$.

   b. Find by double integration the area lying between the parabola $y = 4x - x^2$ and the line $y = x$.

3. a. Evaluate

$$\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz\, dz\, dy\, dx$$

   b. Find the volume of the tetrahedron bounded by the co-ordinate axes and the plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$

4. a. Prove that $\int_0^1 \frac{dx}{\sqrt{1+x^4}} = \frac{1}{4\sqrt{2}}\, \beta\left(\frac{1}{4}, \frac{1}{2}\right)$

   Hence prove $\int_0^1 \frac{x^2\, dx}{\sqrt{1-x^4}} \times \int_0^1 \frac{dx}{\sqrt{1+x^4}} = \frac{\pi}{4\sqrt{2}}$

b. Prove that $\beta\left(m,\frac{1}{2}\right) = 2^{2m-1}\,\beta\,(m,\ m)$

Hence prove $\Gamma\,(m)\ \Gamma\left(m+\frac{1}{2}\right) = \frac{\sqrt{\pi}}{2^{2m-1}}\,\Gamma(2m)$

5. In spherical triangle CDE, Calculate the angles C, D, E if sides $c = 87°10', d = 62°37'$ and side $e = 100°10'$

6. In spherical triangle RST side $t = 80°32'$ side $r = 60°40'$ and $\angle T = 90°$. Calculate $\angle S$, side s and $\angle R$.

7 In spherical triangle LMN, $\angle N = 81°50'$, side $m = 90°$ and $\angle L = 119°07'$ Calculate side $l, \angle M$ and side n .

8 In spherical triangle ABC $\angle A = 81°24.3$, $\angle B = 61°31.7'$ and $\angle C = 102°58'$. Calculate the sides *a*, *b*, *c*

9. In spherical triangle PQR, side $p = 73°5'$, side $q = 90°$ and side $r = 79°12$. Calculate $\angle P, \angle Q, \angle R$