COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra)

SHIVAJI NAGAR, PUNE - 411 005

END Semister Examination
MA-101 Engineering Mathematics 1

Branch Applied Science

Course: Btech
Semister: Sem I
Year: 2014-2015
Duration: 3 Hours Time:-10.00 am to 1.00 pm

Quesstion [I]

1. Attempt (**any three**)
   (a) Solve the following system o linear equations:
   $2x_1 - x_2 + 3x_3 = 0; 3x_1 + 2x_2 + x_3 = 0; x_1 - 4x_2 + 5x_3 = 0.$
   (b) Find all value of c for which the system of equations $5x + 3y + 2z = 12; 2x + 4y + 5z = 2; 39x + 43y + 45z = c$ is consistent. For these values of c, olve the system.
   (c) If the equation $F(x, y, z) = 0$ determines z as a differentiable function of x and y then at points where $F_z \neq 0$, show that $\frac{\partial z}{\partial x} = -\frac{\partial F_x}{\partial F_z}$.
   (d) If the equation $F(x, y, z) = xe^y + ye^z + zlnx - 2 - 3ln2 = 0$, find $\frac{\partial z}{\partial x}$ at $(1, ln2, ln3)$.

2. Describe the matrix A corresponding to the orthogonal projection of R^3 onto the plane $y = x$ woth detail. Determine the principal values and corresponding principle direction of the linear transformation either algebraically or geometrically.

3. Define the null space of a linear transformation from one vector space to another. Prove that the null space f a linear transformation ha dimension 0 if and only of the transformation is one-to-one.

Question [II]

1. Attempt (**any three**)
   (a) If $w = tan^{-}1(\frac{y}{x})$, verify that $w_x y = w_y x$.
   (b) Determine the absolute extreme values of $g(x) = \sqrt{5 - x^2}$.
   (c) Assume that f is continuous on $[a, b]$ and differentiable on (a, b). Also assume that $f(a)$ and $f(b)$ have opposite signs and that $f' \neq 0$ between a and b. Show that $f(x)$ i zero exactly once between a and b.
   (d) For $0 < a < b < 1$, prove that