

F.Y.B.Sc (IT) Sem - I Applied Mathematics - I
 Jun - 2017
 Con. 98-16. **Applied Mathematics - I** OV-4228
 (3 Hours) [Total Marks : 100]

N.B. : (1) All questions are compulsory.
 (2) Attempt any three sub-questions from each Question Nos. 2 to 7.
 (3) Figures to the right indicate full marks.

1. Attempt any one :— 10

(a) If the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ is similar to a diagonal matrix.

Find the diagonal matrix.

(b) If $u = \operatorname{cosec}^{-1} \sqrt{\frac{\frac{1}{x^2} + \frac{1}{y^2}}{\frac{1}{x^3} + \frac{1}{y^3}}}$,

show that $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \frac{\tan u}{12} \left(\frac{13}{12} + \frac{\tan^2 u}{12} \right)$.

2. Attempt any three :— 15

(a) Under what condition the rank of the matrix $A = \begin{bmatrix} 2 & 4 & 2 \\ 2 & 1 & 2 \\ 1 & 0 & x \end{bmatrix}$ is 3?

(b) If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ prove that $A^3 = A^{-1}$.

(c) Find the solution of system.
$$\begin{aligned} x_1 - x_2 + x_3 &= 0 \\ x_1 + 2x_2 - x_3 &= 0 \\ 2x_1 + x_2 + x_3 &= 0 \end{aligned}$$

(d) Reduce the following matrix to the normal form and hence find

its rank $\begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$

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