College of Engineering, Pune
Department of Mathematics
F.Y.B.Tech. (All Branches)
MA 101 Engineering Mathematics-I
Mid Semester Examination

Date: 2^{nd} June 2009

Max. Time:$1\frac{1}{2}$ Hrs.
Max. Marks: 30

Instructions:

(1) Write section-I and section-II on separate answer sheet.
(2) Figures to right indicates full marks.
(3) All symbols have their usual meanings.
(4) Write new question on new page.

Section-I

Solve any three of the following.

(1) Find n^{th} derivative of [05]

$$f(x) = x^2 e^x cosx$$

(2) Use *Leibnitz's rule* and obtain the relation between y_{n+2}, y_{n+1} and y_n [05]

$$where,\ y = sin(msin^{-1}x)$$

(3) State and Prove *Lagrange's* Mean value Theorem. [05]
(4) Let $f(x) = \sqrt{x}$ and $g(x) = \frac{1}{\sqrt{x}}$ be defined in the interval $[a, b]$. Show that there exists a point $c \in (a, b)$ such that, c is geometric mean of a and b. [05]

Section-II

Solve any three of the following.

(1) Solve following system of linear equations by Gauss-Jordan elimination method. [05]

$$x + y + z = 4$$

$$2x + 5y - 2z = 3$$

$$x + y + z = 9$$

Comment on the answer.

(2) Whether following system of linear equations is consistent or not? If it is consistent find its solution. [05]

$$\begin{aligned} x_1 + x_2 + x_3 + x_4 &= 0 \\ 2x_1 + 3x_2 + x_4 &= 0 \\ 3x_1 + 3x_3 + x_4 &= 0 \\ x_1 + 2x_2 + 5x_3 &= 0 \end{aligned}$$

(3) Find two non-singular matrices P and Q such that PAQ is normal form and hence find its rank. [05]

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

(4) Find whether the following vectors are linearly independent or not.[05]

$$\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, \begin{bmatrix} 1 \\ 4 \\ 2 \end{bmatrix}, \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}, \begin{bmatrix} 7 \\ 8 \\ 6 \end{bmatrix}.$$

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