SE -835

Seat No.	

Total No. of Pages : 2

F.Y. B. Tech. (All Branches) (Semester - I) Examination, November - 2018
ENGINEERING MATHEMATICS - I (CBCS)
Sub. Code : 71810

Day and Date : Wednesday, 28 - 11 - 2018 **Total Marks : 70**

Time : 02.30 p.m. to 05.00 p.m.

Instructions :
1) **Attempt any three questions from each section.**
2) **Figures to the right indicate full marks.**
3) **Use of non-programmable calculator is allowed.**

SECTION-I

Q1) a) Test for consistancy and if consistant what is type of solution and find the solution of $x_1 + 2x_2 - x_3 = 3,\ 3x_1 - x_2 + 2x_3 = 1,$
$2x_1 - 2x_2 + 3x_3 = 2,\ x_1 - x_2 + x_3 + 1 = 0$ **[6]**

b) Find the value of k for which the following system of equations have non-trivial solution and find the solutions for these values of k
$3x + y - kz = 0,\ 4x - 2y - 3z = 0,\ 2kx + 4y + kz = 0$ **[6]**

Q2) a) Obtain the eigen values of the following matrix and find the eigen vector corresponding to largest eigen value $\begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ **[6]**

b) Verify Cayley Hamilton's theorem for the following matrix $\begin{pmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{pmatrix}$ **[5]**

Q3) a) Prove that $\left[\dfrac{1+\cos\pi/9 + i\sin\pi/9}{1+\cos\pi/9 - i\sin\pi/9}\right]^{18} = 1$ **[5]**

b) Prove that the continued product of all the values of $(1 + i)^{1/5}$ is $1 + i$ **[6]**

P.T.O.

Q4) Attempt any two from the following **[12]**

a) Reduce the following matrix to normal form and hence find its rank

$$\begin{pmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{pmatrix}$$

b) Obtain the eigen values of A, A^2 and A^{-1} where $A = \begin{pmatrix} 2 & 1 & 1 \\ 1 & 5 & 1 \\ 0 & 0 & 1 \end{pmatrix}$

c) Find all the roots of $x^4 - x^3 + x^2 - x + 1 = 0$

SECTION - II

Q5) a) Solve the following equations by Gauss elimination method $2x + 2y + z = 12,\ 3x + 2y + 2z = 8,\ 5x + 10y - 8z = 10$ **[6]**

b) Solve the following equations up to third iteration by Jacobi iteration method $2x - 3y + 20z = 25,\ 20x + y - 2z = 17,\ 3x + 20y - z = -18$ **[6]**

Q6) a) Expand $7x^4 + 3x^3 - 5x + 10$ in powers of $(x - 1)$ by using Taylors series. **[5]**

b) Evaluate $\lim_{x \to 0} \dfrac{e^x \sin x - x - x^2}{x^2 + x\log(1-x)}$ **[6]**

Q7) a) If $z = \dfrac{x^2 + y^2}{(x+y)}$ Prove that $\left(\dfrac{\partial z}{\partial x} - \dfrac{\partial z}{\partial y}\right)^2 = 4\left(1 - \dfrac{\partial z}{\partial x} - \dfrac{\partial z}{\partial y}\right)$ **[6]**

b) Find the extreme value of the function $2x^3 + xy^2 + 5x^2 + y^2$ **[5]**

Q8) Attempt any two of the following

a) Solve the following equations up to third iteration by Gauss Seidel method $25x + 2y + z = 69,\ 2x + 10y + z = 63,\ x + y + z = 43$ **[6]**

b) If $u = \sin^{-1}\left[\dfrac{x^{\frac{1}{4}} + y^{\frac{1}{4}}}{x^{\frac{1}{5}} + y^{\frac{1}{5}}}\right]$ prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = \dfrac{1}{20}\tan u$ **[6]**

c) Expand $e^{x\cos x}$ in powers of x by using Maclaurin's series. **[6]**

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