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Seat No.	

F.Y.B.Tech. (All Branches) (Semester-I & II) (CBCS)
Examination, November-2019
ENGINEERING MATHEMATICS-I
Sub. Code :71810

Day and Date : Friday, 29 - 11 - 2019 **Total Marks : 70**

Time : 2.30 p.m. to 5.00 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) Reduce the following matrix to normal form and find its rank **[6]**

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

b) Test for consistency the following equations and if possible solve them $2x - y + 3z = 1, \quad 3x + 2y + z = 3, \quad x - 4y + 5z = -1.$ **[6]**

Q2) a) Find the eigen values and eigen vector for smallest eigen value of the following matrix $\begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -5 & -2 \end{bmatrix}$. **[6]**

b) Verify Caley - Hamilton theorem for the matrix **[5]**

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$$

P.T.O.

Q3) a) Evaluate **[5]**

$$\frac{(\cos 2\theta - i\sin 2\theta)^7 (\cos 3\theta + i\sin 3\theta)^5}{(\cos 3\theta + i\sin 3\theta)^{12} (\cos 5\theta - i\sin 5\theta)^7}$$

b) Find all values of $(1+i)^{\frac{4}{5}}$ Also find their continued product. **[6]**

Q4) Attempt any two of the following.

a) Find the eigen values of A and A^3 and transpose of A for the following **[6]**

matrix $A = \begin{bmatrix} 2 & 3 & 4 \\ 0 & 4 & 2 \\ 0 & 0 & 3 \end{bmatrix}$.

b) Solve the following homogeneous simultaneous linear equations **[6]**

$6x+2y+3z=0;\quad 2x+3y+z=0,\quad 4x+5y+4z=0,\quad x+2y-2z=0$

c) Expand $\cos^7\theta$ in a series of cosines of multiples of θ **[6]**

SECTION-II

Q5) a) Solve $2x + 5y - 3z + 17 = 0$, $5x - 3y + 2z = 17$, $3x + 2y + 5z = 4$ by Gauss Elimination method. **[6]**

b) Using Jacobi's method find the solution of following equations correct upto three decimal places

$15x_1 + x_2 - x_3 = 14,\ x_1 + 20x_2 + x_3 = 23,\ 2x_1 - 3x_2 + 18x_3 = 37$ **[6]**

Q6) a) Evaluate $\lim\limits_{x\to 0} \dfrac{\tan x - \sin x}{\sinh^3 x}$ **[5]**

b) Expand $(x+1)^5 - 2(x+1)^4 + 3(x+1)^3 - 4(x+1)^2$ **[6]**

Q7) a) If u = log (tan x + tan y + tan z) then prove that

$$\sin 2x\frac{\partial u}{\partial x}+\sin 2y\frac{\partial u}{\partial y}+\sin 2z\frac{\partial u}{\partial z}=2$$ **[5]**

b) If $u = x^2 \log\left(\frac{\sqrt[3]{y}-\sqrt[3]{x}}{\sqrt[3]{y}+\sqrt[3]{x}}\right)$ find

$$x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial x} \; and \; x^2\frac{\partial^2 u}{\partial x^2}+2xy\frac{\partial^2 u}{\partial x\partial y}+y^2\frac{\partial u}{\partial x^2}$$ **[6]**

Q8) Attempt any two of the following. **[12]**

a) Find the solution of 83x + 11y – 4z = 95, 7x + 52y + 13z = 104,3x + 8y +29 z = 71 by Gauss Seidel method correct upto four decimal places.

b) Find the expansion of log (1+ sin x) at least upto the term of x^4

c) If $x = \sqrt{vw}, y = \sqrt{wu}, z = \sqrt{uv}$ then prove that $JJ' = 1$

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