Seat No.	

F.Y. B.Tech (All Branches) (Semester - I) (CBCS)
Examination, May - 2019
Engineering Mathematics - I
Sub. Code : 71810

Day and Date : Tuesday, 21 - 05 - 2019 **Total Marks : 70**

Time : 10.00 a.m. to 12.30 p.m.

Instructions :
1) **Attempt any three questions from each section.**
2) **Figures to 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]**

$$\begin{bmatrix} 1 & 3 & 4 & 5 \\ 1 & 2 & 6 & 7 \\ 1 & 5 & 0 & 10 \end{bmatrix}$$

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

Q2) a) Find the eigen values of A and $\frac{1}{2}$A. **[6]**

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

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

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

Q3) a) Express $\dfrac{(1+i\sqrt{3})^{16}}{(\sqrt{3}-i)^{17}}$ in terms of a + ib. **[6]**

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

Q4) Attempt any two of the following :

a) Show that characteristics equations of A and transpose of A are equal

for $A=\begin{bmatrix} 2 & 3 & 4 \\ 0 & 4 & 2 \\ 0 & 0 & 3 \end{bmatrix}$. **[6]**

b) For what value of λ equations posses a non trivial solution. **[6]**

$3x-2y+\lambda z=0,\ 2x+y+z=0,\ x+2y-\lambda z=0$ Also find the solution for the value of λ.

c) Prove that $\dfrac{\sin 7\theta}{\sin\theta}=7-56\sin^2\theta+112\sin^4\theta-64\sin^6\theta$. **[6]**

SECTION - II

Q5) a) Solve $5x-2y-3z+1=0,\ 3x-9y-z+2=0,\ 2x-y-7z=3$ by Gauss Seidel method correct upto four decimal places. **[6]**

b) Using Jacobi's method find the solution of following equations correct upto five iterations **[6]**

$8x_1+2x_2-2x_3=8,\ x_1-8x_2+3x_3+4=0,\ 2x_1+x_2+9x_3=12.$

Q6) a) Evaluate $\lim\limits_{x\to 2}\sqrt{\dfrac{2+x}{2-x}}\tan^{-1}\sqrt{4-x^2}$. **[5]**

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

Q7) a) If $u = x^y$ prove that $\frac{\partial^3 u}{\partial x^2 \partial y} = \frac{\partial^3 u}{\partial x \partial y \partial x}$. **[5]**

b) If $u = \tan^{-1}\left(\frac{x^3 + y^3}{x + y}\right)$ then prove that

$$x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = 2 \sin u \cos 3u$$ **[6]**

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

a) Find the solution of $2x - 3y - 4z + 4 = 0$, $3x - 4y - 2z = 5$, $4x - 2y - 3z + 1 = 0$ by Gauss elimination method.

b) Evaluate $\lim_{x \to 0}\left[\frac{\pi x - 1}{2x^2} + \frac{\pi}{x(e^{2\pi x} - 1)}\right]$.

c) Find the maximum and minimum value of $\sin x + \sin y + \sin(x + y)$.

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