Seat No.	

First Year Engineering (All Branches) (Semester - I & II) Examination, May - 2017
ENGINEERING MATHEMATICS - I
Sub. Code : 59177

Day and Date : Saturday, 20 - 05 - 2017 | Total Marks : 100

Time : 10.00 a.m. to 1.00 p.m.

Instructions :
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of non-programmable calculator is allowed.

SECTION - I

Q1) Attempt any "Three" of the following: **[15]**

a) Find the rank of matrix A by reducing to its normal form if

$$A=\begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$$

b) Test for consistency and if possible solve the equations $x + y + z = 3$; $x + 2y + 3z = 4$; $x + 4y + 9z = 6$.

c) Investigate values of λ and μ if the equations has an infinite no.of solutions.

$2x - 5y + 2z = 8$; $2x + 4y + 6z = 5$; $x + 2y + \lambda x = \mu$.

d) Use matrix method to solve the equations

$2x - y + 3z = 0$; $3x + 2y + z = 0$; $x - 4y + 5z = 0$.

P.T.O.

Q2) Attempt any "Three" of the following: **[15]**

a) Examine for linear dependence or independence of vectors [1 1 1 3]; [1 2 3 4]; [2 3 4 7]. If dependent find the relation between them.

b) Find eigen vector corresponding to the greatest eigen value of the matrix

$$A=\begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{bmatrix}.$$

c) Verify Caley-Hamilton's theorem for the matrix $A=\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$.

d) Find eigen values of the matrices:

i) A^{-1}

ii) (Adj. A)

iii) 4A

if the matrix $A=\begin{bmatrix} -2 & 5 & 4 \\ 5 & 7 & 5 \\ 4 & 5 & -2 \end{bmatrix}$.

Q3) Attempt any "Four" of the following: **[20]**

a) Find all the roots of $(1+i)^{1/5}$.

b) Prove that $\left[\dfrac{\sin(6\theta)}{\sin\theta}\right]=32\cos^5\theta-32\cos^3\theta+6\cos\theta$.

c) Separate into real and imaginary parts of $\tan^{-1}(\alpha+i\beta)$.

d) If $\sin(\theta+i\phi)=r[\cos\alpha+i\sin\alpha]$ then prove that

$$r^2=\frac{1}{2}\ [\cosh(2\phi)-\cos(2\theta)]$$

e) Solve the equation completely

$x^8+x^5+x^3+1=0$.

SECTION - II

Q4) Attempt Any Three of the following: **[15]**

a) Expand $\log(1 + e^x)$ by Maclaurian's theorem up to the term x^4.

b) Expand $(1+x)^{1/x}$ up to the term containing x^2.

c) Expand $\log x$ in powers of $(x - 2)$.

d) Evaluate $\lim\limits_{x\to 1}\dfrac{xe^x-\log(1+x)}{x^2}$.

Q5) Attempt Any Four of the following: **[20]**

a) If $u = e^{xyz}$; find $\dfrac{\partial^3 u}{\partial x\partial y\partial z}$.

b) If $z=f(x,y)$ and $x=uv; y=u^2-y^2$ then prove that

$$\frac{\partial z}{\partial y}=\frac{1}{2\left(u^2+v^2\right)}\left[u\frac{\partial z}{\partial u}-v\frac{\partial z}{\partial v}\right]$$

c) If $\sin u=\dfrac{x^{1/4}+y^{1/4}}{x^{1/5}+y^{1/5}}$ then prove that

$$x^2\frac{\partial^2 u}{\partial x^2}+2xy\frac{\partial^2 u}{\partial x\partial y}+y^2\frac{\partial^2 u}{\partial y^2}=\frac{1}{400}\tan u\left[\tan^2 u-19\right].$$

d) Find $\left[(3.82)^2+2(2.1)^3\right]^{1/5}$ approximately by using theory of approximation.

e) Find the maximum and minimum value of $x^3+3xy^2-3x^2-3y^2+4$.

Q6) Attempt Any Three of the following: **[15]**

a) Solve by Gauss elimination method

$3x - y + 2z = 12; x + 2y + 3z = 11; 2x - 2y - z = 2$.

b) Solve by Jacobi method (carry out five iterations)

$6x + 3y + 12z = 35; 8x - 3y + 2z = 20; 4x + 11y - z = 33$.

c) Solve by Gauss-Seidal method.

$27x + 6y - z = 85; 6x + 15y + z = 72; x + y + 54z = 110$

d) Find largest eigen value of $A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ by power method with

$X = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ as the initial eigen vector.