SV - 9

Seat No.	

Total No. of Pages : 4

First Year Engineering (All Branches) (Semester - I) Examination, May - 2018
ENGINEERING MATHEMATICS - I
Sub. Code: 59177

Day and Date : Saturday, 19 - 05 - 2018 **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) Reduce matrix A to its normal form and hence find its rank,

$$A = \begin{bmatrix} 1 & -1 & 3 & 6 \\ 1 & 3 & -3 & -4 \\ 5 & 3 & 3 & 11 \end{bmatrix}.$$

b) Test for consistency the following equations and if possible solv the equations $6x+y+z=4$; $2x-3y-z=0$; $x+7y+2z=-7$.

c) Use matrix method to solve $x+y+2z=0$; $x+2y+3z=0$; $x+3y+4z=0$; $3x+4y+7z=0$.

d) If following equations has non-zero solutions then find the values of λ and solve them also $x+2y+3z=\lambda x$; $3x+y+2z=\lambda y$; $2x+3y+z=\lambda z$.

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

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

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

$$A = \begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}.$$

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c) Using caley-Hamilton's theorem find inverse of matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$.

d) Find eigen values of the matrices A^{-1}, A^T and (Adj-A) if the matrix A is given by $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$.

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

a) Simplify $\left\{ \dfrac{[\cos(5\theta) - i\sin(5\theta)]^2 [\cos(7\theta) + i\sin(7\theta)]^{-3}}{[\cos(4\theta) - i\sin(4\theta)]^9 [\cos\theta + i\sin\theta]^5} \right\}$

b) Prove that $\sin^5\theta = \dfrac{1}{16}[\sin(5\theta) - 5\sin(3\theta) + 10\sin\theta]$.

c) Solve the equation completely $x^6 - i = 0$.

d) Prove that $\tanh^{-1} x = \dfrac{1}{2}\log\left(\dfrac{1+x}{1-x}\right)$.

e) Seprate into real and imaginary parts of $\left[\cos^{-1}\left(\dfrac{3i}{4}\right)\right]$.

SECTION - II

Q4) Attempt any three of the following: **[15]**

a) Using Maclaurina's series, expand $\tan x$ up to the terms containing x^5.

b) Expand $\log\cos\left(x + \dfrac{\pi}{4}\right)$, using Taylor's theorem in ascending power of x.

c) Expand $\sin^{-1} x$ in ascending powers of x up to the term containing x^5.

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

Q5) Attempt any four of the following: **[20]**

a) If $u = \sin\left(\sqrt{x} + \sqrt{y}\right)$; prove that

$$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\left(\sqrt{x} + \sqrt{y}\right)\cos\left(\sqrt{x} + \sqrt{y}\right)$$

b) If $u = \log\left(\frac{x^3 + y^3}{x^2 + y^2}\right)$; prove that

i) $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$

ii) $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2}$

c) If $x + y + z = u$; $y + z = uv$; $z = uvw$ then find $\frac{\partial(x, y, z)}{\partial(u, v, w)}$.

d) Find the possible error in percentage in measuring the parallel resistance R of two resistances R_1 and R_2 which undergo a positive error of 2% each in their own measurement.

e) Find the stationary value of $xy(a - x - y)$ where $a > 0$.

Q6) Attempt any three of the following: **[15]**

a) Solve by Gauss elimination method $x + y - z = 2$; $2x + 3y + 5z = -3$; $3x + 2y - 3z = 6$.

b) Apply Gauss-Jordan method to solve the equations $x + y + z = 9$; $2x - 3y + 4z = 13$; $3x + 4y + 5z = 40$.

c) Solve the following system of equations by Jacobi iteration method

$10x + y - z = 11.9$; $x + 10y + z = 28.08$; $-x + y + 10z = 35.61$.

d) Find the largest Eigen value of the matrix $A = \begin{bmatrix} 2 & 3 & 2 \\ 4 & 3 & 5 \\ 3 & 2 & 9 \end{bmatrix}$ by taking

$X = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ as initial Eigen vector by using power method.

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