GOVERNMENT COLLEGE OF ENGINEERING
(An autonomous institute of Govt. of Maharashtra)

CT-1 W-2016 SHU-101 ENGG. MATHS-1 [CE/MECH/ELPO/EXTC/CS/IN/IT] MARKS-15
TIME-1 HOUR
Date-19/09/2016

1. Find the eigen values and eigen vectors of a matrix $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ (3)

2. Attempt any Four (12)

a) Define linearly dependent and independent. Is the system of vectors $X_1 = (2,2,1)', X_2 = (1,3,1)', X_3 = (1,2,2)'$ linearly dependent.

b) Find the characteristic equation for $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$ and use it to simplify the expression $A^5 + 5A^4 - 6A^3 + 2A^2 - 4A + 7I$

c) For different values of k, discuss the nature of solution for the system of equation $x + 2y - z = 0,\ 3x + (k+7)y - 3z = 0,\ 2x + 4y + (k-3)z = 0$

d) Find non singular matrices P and Q such that PAQ is in normal form if

$$A = \begin{bmatrix} 1 & 2 & 3 & -2 \\ 2 & -2 & 1 & 3 \\ 3 & 0 & 4 & 1 \end{bmatrix}$$

e) Find the rank of a matrix by using Echelon form, where

$$A = \begin{bmatrix} 0 & 2 & 1 & 1 \\ 3 & 5 & 1 & 2 \\ 5 & -1 & 2 & 2 \\ 2 & 6 & 5 & 3 \\ 1 & 3 & -3 & -1 \end{bmatrix}$$

$-\frac{6}{2} + 5A$ $\frac{23A}{5}$ $-\frac{2}{5}A + 5A$ sin

GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI
CLASS TEST NO.1 Winter-2015
SHU101, ENGINEERING MATHEMATICS-I

CLASS: B.Tech First Year Date:07/09/2015 Max Marks:15

Que 1: **Attempt any four of the following:** **(12)**

a) Define rank of matrix and hence find it of $\begin{bmatrix} 2 & -1 & 0 & 5 \\ 0 & 3 & 1 & 4 \end{bmatrix}$.Verify it using normal form.

b) Reduce the following matrix to echelon form and find its rank .

$$\begin{bmatrix} 3 & 2 & -4 & 3 & 6 \\ 1 & -2 & 3 & 4 & -3 \\ 2 & -4 & 6 & 8 & -6 \\ 3 & -6 & 9 & 12 & -9 \\ 5 & -2 & 2 & 11 & 0 \end{bmatrix}$$

c) Determine the values of λ for which the following set of equations may possess nontrivial solution. $3x + y - \lambda z = 0;\ 4x - 2y - 3z = 0;\ 2\lambda x + 4y + \lambda z = 0$. For each permissible value of λ, determine the general solution.

d) For the matrix A , find non-singular matrices P and Q such that PAQ is in the normal form and hence find A^{-1}, where $A = \begin{bmatrix} 8 & 4 & -3 \\ 2 & 1 & 1 \\ 1 & 2 & 1 \end{bmatrix}$

e) State Cayley Hamilton theorem and use it to find the matrix A^{64} if $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$

[PTO]

Course Code: ...

Name: Engineering Mathematics – I URATION: 1.00 Hr.

Max. Marks: 60

SHU101 **GOVT.COLLEGE OF ENGINEERING, AMRAVATI**

Engineering Mathematics-I **Class Test-I** **Max. Marks :15**

Que 1: Attempt the following:

b) show that the eigen vector of a matrix A corresponding to eigen value 4 and eigen vector of matrix $D = 2A^2 - \frac{1}{2}A + 3I$ corresponding to eigen value 33 are same, if $A = \begin{pmatrix} 8 & -4 \\ 2 & 2 \end{pmatrix}$ **(06)**

b) Are the following vectors L.D ? if so find the relation between them.

$$x_1 = (0, a-b, a-c, b+c)^T$$
$$x_2 = (b-a, 0, b-c, c+a)^T$$
$$x_3 = (c-a, c-b, 0, a+b)^T$$
$$x_4 = (b+c, c+a, a+b, 0)^T$$

Que 2 : Attempt any three of the following: **(09)**

a) Find the rank by using Echelon form of the matrix $A = \begin{bmatrix} 1 & -1 & 3 & 6 \\ 1 & 3 & -3 & 4 \\ 5 & 3 & 3 & 11 \end{bmatrix}$

b) Verif Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ 1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and hence find A^{-1}

c) For what values of λ the equations $x+y+z=1$, $x+2y+4z=\lambda$, $x+4y+10z=\lambda^2$ has a solution and solve

d) i) Define linear dependence & lincar independance of vectors.

ii) State cayley Hamilton Theorem iii) Explain the Consistency in Non-homogenous Equation.

$\lambda^2 - 1 - 3\lambda + 3$

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