

Enrollment No: \_\_\_\_\_

Exam Seat No: \_\_\_\_\_

# C.U.SHAH UNIVERSITY

## Summer Examination-2016

**Subject Name: Engineering Mathematics-II****Subject Code: 4TE02EMT1****Branch: B.Tech(All)****Semester: 2      Date: 09/05/2016****Time: 10:30 to 1:30****Marks: 70****Instructions:**

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

**Q-1 Attempt the following questions:****(14)****a)** A square matrix  $A$  is called symmetric matrix if

- (a)  $A^T = -A$       (b)  $A^2 = A$       (c)  $A^T = A$       (d)  $A^2 = I$

**b)** The determinant of the matrix  $\begin{bmatrix} 1 & 5 & 3 \\ 0 & -2 & 4 \\ 0 & 0 & 3 \end{bmatrix}$  is

- (a) 1      (b) 2      (c) 6      (d) - 6

**c)** A  $n \times n$  Non-Homogeneous system of equations  $AX = B$  is given. If $\rho(A) = \rho(A : B) < n$  then the system has

- (a) No solutions      (b) Unique solutions  
(c) Infinite solution      (d) None of these

**d)** The sum of the Eigen values of the matrix  $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 2 \\ 0 & 0 & 3 \end{bmatrix}$  is

- (a) 1      (b) 2      (c) 6      (d) - 6

**e)** The rank of the matrix  $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 7 \end{bmatrix}$  is

- (a) 1      (b) 2      (c) 3      (d) 0

**f)**  $\int_0^2 \int_2^4 \int_4^6 dx dy dz = \underline{\hspace{2cm}}$ 

- (a) 1      (b) 6      (c) 4      (d) 8



g)  $\int_0^1 \int_0^{\sqrt{x}} dy dx = \underline{\hspace{2cm}}$

- (a)  $\frac{1}{2}$       (b)  $\frac{2}{3}$       (c) 0      (d) y

h)  $\int_{-\pi/2}^{\pi/2} \sin^9 x dx = \underline{\hspace{2cm}}$

- (a) 0      (b) 1      (c)  $\frac{\pi}{2}$       (d)  $\frac{1}{2}$

i) The value of  $\int_{-\pi}^{\pi} \sin mx \sin nx dx$  for  $m \neq \pm n$  is

- (a)  $2\pi$       (b)  $\pi$       (c)  $\frac{\pi}{2}$       (d) 0

j)  $\int_1^{\infty} \frac{1}{x^2} dx$  is

- (a) Converges      (b) Diverges      (c) Oscillatory      (d) None of these

k) The order of the differential equation  $\frac{d^2y}{dx^2} = \left[ 1 + \left( \frac{dy}{dx} \right)^3 \right]^{\frac{2}{3}}$  is

- (a) 1      (b) 2      (c) 3      (d) 6

l) The equation  $P(x, y) dx - Q(x, y) dy = 0$  is exact if

- (a)  $P_x = Q_y$       (b)  $P_y = Q_x$       (c)  $P_x = -Q_y$       (d)  $P_y = -Q_x$

m) A vector  $\vec{F}$  is said to be solenoidal if

- (a)  $\nabla \times \vec{F} = 0$       (b)  $\nabla \cdot \vec{F} = 0$       (c)  $\nabla \times (\nabla \cdot \vec{F}) = 0$       (d) None of these

n) If  $r = xi + yj + zk$  then  $\text{div } r$  is

- (a) 0      (b) r      (c) 3      (d) -r

**Attempt any four questions from Q-2 to Q-8**

**Q-2 Attempt all questions**

a) Find the volume common to the cylinder  $x^2 + y^2 = a^2$  and  $x^2 + z^2 = a^2$ . (05)

b) Evaluate:  $\int_0^{\pi} x \sin^8 x \cos^6 x dx$  (05)

c) Solve:  $\frac{dy}{dx} - \frac{3y}{x} = x^3$ ,  $y(1) = 4$  (04)



**Q-3 Attempt all questions**

a) Find the inverse of the matrix  $A = \begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$  by using determinant method. (05)

b) Solve the following system of equations by Cramer's rule: (05)  
 $x + y + z = 6$ ;  $x + 2y + 3z = 14$ ;  $x + 4y + 9z = 36$

c) Reduce the matrix  $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 5 \\ 4 & 5 & 6 & 7 \\ 11 & 12 & 13 & 14 \end{bmatrix}$  to the normal form and find its rank. (04)

**Q-4 Attempt all questions**

a) Find the inverse of the following matrix by using elementary transformation (05)

$$A = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$$

b) Obtain Reduced row echelon form of the following matrix: (05)

$$A = \begin{bmatrix} 1 & 3 & 2 & 1 \\ 2 & 3 & 3 & 2 \\ 3 & 4 & -1 & 3 \\ 6 & 10 & 4 & 6 \end{bmatrix}$$

c) Solve the system of equation (04)  
 $x + 2y - z = 3$ ;  $3x - y + 2z = 1$ ;  $2x - 2y + 3z = 2$ ;  $x - y + z = -1$

**Q-5 Attempt all questions**

a) Evaluate:  $\int_0^{\log 2} \int_0^x \int_0^{x+y} e^{x+y+z} dz dy dx$  (05)

b) Solve:  $\frac{dy}{dx} + x \sin 2y = x^2 \cos^2 y$  (05)

c) Evaluate  $\int_c \vec{F} \cdot d\vec{r}$  along the parabola  $y^2 = x$  between the points  $(0,0)$  and (04)  
 where  $\vec{F} = x^2 \hat{i} + xy \hat{j}$ .



**Q-6 Attempt all questions**

a) Find the eigenvalues & eigenvectors of a matrix  $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ . (05)

b) Show that  $\vec{F} = (y^2 - z^2 + 3yz - 2x)\hat{i} + (3xz + 2xy)\hat{j} + (3xy - 2xz + 2z)\hat{k}$  is both solenoidal and irrotational. (05)

c) Define: Gradient and find  $\nabla\phi$  at  $(1, -2, 1)$ , if  $\phi = 3x^2y - y^3z^2$ . (04)

**Q-7 Attempt all questions**

a) Change the order of integration and evaluate  $\int_0^a \int_{\frac{x}{a}}^{\sqrt{x}} (x^2 + y^2) dx dy$ . (05)

b) Find the area bounded by the parabola  $y^2 = 4x$  and the line  $2x - 3y + 4 = 0$ . (05)

c) Solve:  $2xy dy + (x^2 + y^2 + 1) dx = 0$  (04)

**Q-8 Attempt all questions**

a) State and verify Cayley-Hamilton theorem for the matrix  $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ . (07)

b) Verify Green's theorem for  $\oint_C [(x^2 - 2xy) dx + (x^2y + 3) dy]$  where  $C$  is the boundary of the region bounded by the parabola  $x^2 = y$  and the line  $x = y$ . (07)

