

# C.U.SHAH UNIVERSITY

## Summer Examination-2017

**Subject Name : Engineering Mathematics-II**

**Subject Code : 4TE02EMT1**

**Branch: B.Tech (All)**

**Semester : 2**

**Date:04/05/2017**

**Time : 02:00 To 05:00**

**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 skew symmetric matrix if (1)**

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

**B)  $\int_1^2 \int_0^x y dx dy = \dots\dots$  (1)**

- (a)  $\frac{3x}{2}$     (b)  $\frac{7}{6}$     (c)  $\frac{6}{7}$     (d) None of these

**C)  $\int_0^{2\pi} \sin^7 x dx = \dots\dots$  (1)**

- (a)  $\frac{3}{8}$     (b)  $\frac{7}{6}$     (c) 0    (d) None of these

**D)  $\int_1^{\infty} \frac{1}{x^2} dx$  is (1)**

- (a) convergent    (b) divergent    (c) both (a) & (b)    (d) None of these

**E) A  $n \times n$  Non-Homogeneous system of equations  $AX = B$  is given. If (1)**

$\rho(A) \neq \rho(A : B)$  then the system has

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

**F) A vector  $\vec{F}$  is said to be ir-rotational if (1)**

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

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

- (a) 7    (b) 5    (c) -6    (d) -4



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

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

I) The equation  $P(x, y)dx + Q(x, y)dy = 0$  is exact if (1)

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

J) If matrix  $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 2 \\ 0 & 0 & 3 \end{bmatrix}$ , then trace(A)=..... (1)

- (a) 2      (b) 5      (c) 7      (d) 6

K) The product of the Eigen values of the matrix  $A = \begin{bmatrix} 2 & 2 & 3 \\ 0 & -2 & 2 \\ 0 & 0 & -3 \end{bmatrix}$  is (1)

- (a) 1      (b) 12      (c) 6      (d) -6

L) The rank of the matrix  $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 8 & 12 \end{bmatrix}$  is (1)

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

M) If  $r = 2xi + 3yj - 5zk$  then div r is (1)

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

N) If  $J = \frac{\partial(u, v)}{\partial(x, y)}$  &  $J' = \frac{\partial(x, y)}{\partial(u, v)}$ , then  $JJ' = \dots\dots\dots$  (1)

- (a) 1      (b) -1      (c) 0      (d) None of these

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

**Q.2 Attempt all questions (14)**

A) Find the inverse of the matrix  $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$ . (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.3 Attempt all questions (14)**

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

B) Evaluate  $\int_0^{\infty} \frac{x^2}{(1+x^2)^{\frac{9}{2}}} dx$  (05)



C) Evaluate  $\int_0^{\pi} \cos^{10} x dx$  (04)

**Q.4 Attempt all questions** (14)

A) Find Eigen values & eigen vectors of the matrix  $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ . (06)

B) Verify Cayley-Hamilton theorem of matrix  $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$  & hence finds its (06)

inverse.

C) State Stoke's theorem. (04)

**Q.5 Attempt all questions** (14)

A) Solve:  $\frac{dy}{dx} - \frac{y}{(x+1)} = e^{3x}(x+1)$ . (05)

B) Evaluate  $\iint_R (x+y)^2 dx dy$ , where R is the region bounded (05)

by  $x+y=0, x+y=1, 2x-y=0, 2x-y=3$ , using transformations  
 $u = x+y, v = 2x-y$

C) Evaluate  $\int_0^a \int_0^x \int_0^{x+y} e^{(x+y+z)} dz dy dx$ . (04)

**Q.6 Attempt all questions** (14)

A) Evaluate  $\iint_R x^2 dA$ , where R is region bounded by the hyperbola  $xy=16$  & the lines (05)  
 $y=x, y=0, x=8$ .

B) Define: Divergence. For which value of the component  $v_3$  is (05)  
 $v = e^x \cos y i + e^x \sin y j + v_3 k$  is Solenoidal.

C) Evaluate  $\int_0^{\pi} x \sin^5 x \cos^4 x dx$  (04)

**Q.7 Attempt all questions** (14)

A) Sketch the region of integration, reverse the order of integration & evaluate the (05)

integral  $\int_0^2 \int_0^{4-x^2} \frac{x e^{2y}}{4-y} dy dx$ .

B) Define Curl of a Vector field. Show that A fluid motion is given by (05)  
 $v = (y \sin z - \sin x) i + (x \sin z + 2yz) j + (xy \cos z + y^2) k$  is Irrotational .

C) Find Gradient of  $f(x, y, z) = 2z^3 - 3(x^2 + y^2)z + \tan^{-1}(xz)$  at (1,1,1). (03)

**Q.8 Attempt all questions** (14)

A) State Green's Theorem. Verify Green's Theorem for (09)

$\oint_C [(x^2 - 2xy) dx + (x^2 y + 3) dy]$  Where C is the boundary of the bounded

region by the parabola  $y = x^2$  & line  $y = x$ .



- B)** Define: Line Integral. Find Workdone if  $\vec{F} = 2x^2j + 3xyk$  displace a particle in the  $xy$ -plane from  $(0,0)$  to  $(1,4)$  along the curve  $y = 4x^2$ . **(05)**

