

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)
 $v = e^x \cos yj + e^x \sin yj + v_3k$ 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 $\int_0^2 \int_0^{4-x^2} \frac{xe^{2y}}{4-y} dy dx$.

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)

$\oint_C [(x^2 - 2xy)dx + (x^2y + 3)dy]$ 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)**

