Enrollment No: ______________________ **Exam Seat No:**______________________

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) $\int_1^2 \int_0^x y\,dx\,dy = ...$ (1)

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

C) $\int_0^{2\pi} \sin^7 x\,dx = ...$ (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 $\rho(A) \neq \rho(A:B)$ then the system has (1)

(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

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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'=……… (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)**

$x+y+z=6;\quad x+2y+3z=14;\quad x+4y+9z=36$

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 $\int_0^\infty \frac{x^2}{\left(1+x^2\right)^{\frac{9}{2}}}dx$ **(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 inverse. **(06)**

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 $\iint_R (x+y)^2\, dxdy$, where R is the region bounded by $x+y=0, x+y=1, 2x-y=0, 2x-y=3,$ using transformations $u=x+y, v=2x-y$ **(05)**

C) Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{(x+y+z)} dzdydx.$ **(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 $y=x, y=0, x=8.$ **(05)**

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

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 integral $\int_0^2 \int_0^{4-x^2} \frac{xe^{2y}}{4-y} dydx.$ **(05)**

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

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 $\oint_c \left[(x^2-2xy)dx+(x^2y+3)dy\right]$ Where C is the boundary of the bounded region by the parabola $y=x^2$ & line $y=x$. **(09)**

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