

Enrollment No: _____

Exam Seat No: _____

C.U.SHAH UNIVERSITY

Summer Examination-2016

Subject Name: Engineering Mathematics-II**Subject Code: 4TE02EMT2****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) $\int_{-\pi/2}^{\pi/2} \sin^7 x \, dx = \underline{\hspace{2cm}}$

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

b) $\int_0^{\pi/2} \sqrt{1 - \frac{1}{4} \sin^2 \theta} \, d\theta = \underline{\hspace{2cm}}$

- (a) $E\left(\frac{1}{2}\right)$ (b) $E\left(\frac{1}{4}\right)$ (c) $K\left(\frac{1}{2}\right)$ (d) $K\left(\frac{1}{4}\right)$

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

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

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

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

e) $\beta\left(\frac{1}{2}, \frac{1}{2}\right) = \underline{\hspace{2cm}}$.

- (a) $\sqrt{\pi}$ (b) 1 (c) 0 (d) π



- f) $\Gamma(n)\Gamma(1-n) = \underline{\hspace{2cm}}$
- (a) $\frac{\pi}{\cos n\pi}$ (b) $\frac{\sqrt{\pi} \Gamma(2n)}{2^{2n-1}}$ (c) $\frac{\sqrt{\pi} \Gamma(n)}{2^{2n}}$ (d) $\frac{\pi}{\sin n\pi}$
- g) The curve $y^2(2a-x) = x^3$ represents
- (a) Cissoid of Diocle (b) Witch of Agnesi
(c) Folium of Descartes (d) Strophoid
- h) The curve passes through the origin, if the equation does not contain _____
- (a) terms in x (b) terms in y (c) constant term (d) none of these
- i) Length of curve for $x = f(y)$ is defined by
- (a) $\int_{x_1}^{x_2} \sqrt{1 + \left(\frac{dy}{dx}\right)^2} dx$ (b) $\int_{x_1}^{x_2} \sqrt{1 + \left(\frac{dy}{dx}\right)^2} dx$
(c) $\int_{y_1}^{y_2} \sqrt{1 + \left(\frac{dx}{dy}\right)^2} dx$ (d) $\int_{y_1}^{y_2} \sqrt{1 + \left(\frac{dx}{dy}\right)^2} dx$
- j) $\int_0^2 \int_2^4 \int_4^6 dx dy dz = \underline{\hspace{2cm}}$
- (a) 1 (b) 6 (c) 4 (d) 8
- k) The order of the differential equation $\frac{d^2 y}{dx^2} = \left[1 + \left(\frac{dy}{dx}\right)^3\right]^{\frac{2}{3}}$ 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) The series $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \dots$ is convergent then sum of the series
- (a) 1 (b) 2 (c) $\frac{1}{2}$ (d) none of these
- n) The series $1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$ is
- (a) convergent (b) divergent (c) oscillatory (d) none of these



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

Q-3 Attempt all questions

a) Evaluate: $\int_{-\infty}^{\infty} e^{-h^2 x^2} \, dx$ (05)

b) Prove that (i) $\operatorname{erfc}(-x) = 2 - \operatorname{erfc}(x)$ (05)
(ii) $\operatorname{erf}(-x) = -\operatorname{erf}(x)$

c) Test for the convergence the series $\sum_{n=1}^{\infty} \frac{[(n+1)x]^n}{n^{n+1}}$ (04)

Q-4 Attempt all questions

a) Find the radius of convergence and interval of the series $\sum_{n=1}^{\infty} \frac{x^n}{\sqrt{n}}$. (05)

b) Trace the curve $r^2 = a^2 \cos 2\theta$. (05)

c) Prove that $\int_0^1 \left(\frac{x}{1-x^3} \right)^{\frac{1}{2}} dx = \frac{\pi}{3}$. (04)

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) Test for convergence the series $4 - 1 + \frac{1}{4} - \frac{1}{16} + \dots$ and if it is convergent then also find its sum. (04)



Q-6 Attempt all questions

- a) Find the area bounded by the parabola $y^2 = 4x$ and the line $2x - 3y + 4 = 0$. (05)
- b) Prove that $\int_0^a x^5 (2a^2 - x^2)^{-3} dx = \frac{1}{2} \left(\log 2 - \frac{1}{2} \right)$. (05)
- c) Find the orthogonal trajectories of the family of parabola $ay^2 = x^3$. (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) In a circuit containing resistance R, inductance L, the voltage E and the current i are connected in series. Given that $L = 640$ henries, $R = 250$ ohms, $E = 500$ volts and $i = 0$ when $t = 0$. Find the time that elapses before i reach 90% of its maximum value. (05)
- c) Solve: $2xy dy - (x^2 + y^2 + 1) dx = 0$ (04)

Q-8 Attempt all questions

- a) Evaluate: $\int_0^{\infty} \frac{dx}{\sqrt{x^2 + 16}\sqrt{x^2 + 25}}$ (05)
- b) Trace the curve $y^2(a + x) = x^2(a - x)$. (05)
- c) Find the whole length of the lemniscates of Bernoulli $r^2 = a^2 \cos 2\theta$. (04)

