

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)  $2\pi$       (b)  $\pi$       (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)  $\pi$



- 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)

