

C.U.SHAH UNIVERSITY

Summer Examination-2016

Subject Name : Engineering Mathematics-I

Subject Code : 4TE01EMT1

Branch : B.Tech(All)

Semester : 1

Date :21/04/2016

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) If $z = re^{i\theta}$, then $|re^{iz}| =$
- a) $e^{r\sin\theta}$ b) $e^{-r\sin\theta}$ c) $e^{-r\cos\theta}$ d) $e^{r\cos\theta}$
- b) The Imaginary part of Complex number e^{3z} is
- a) $e^y \sin x$ b) $e^x \cos y$ c) $e^{3x} \cos 3y$ d) $e^{3x} \sin 3y$
- c) $\lim_{x \rightarrow 0} \frac{\cos x}{x} = \underline{\hspace{2cm}}$.
- a) 0 b) 1 c) ∞ d)-1
- d) $\lim_{x \rightarrow 0} \frac{x - \sin x}{x} = \underline{\hspace{2cm}}$.
- a) 0 b) 1 c) ∞ d)-1
- e) The series $\sum \frac{1}{n}$ is
- a) Convergent b) Divergent c) non-convergent d) a & b both
- f) The series $\sum_{n=1}^{\infty} \frac{3n-5}{11n^2+2}$ is
- a) Convergent b) Divergent c) non-convergent d) None of these
- g) If the power of x & y both are even ,then the curve is symmetrical about
- a) X-axis b) Y-axis c) about both X & Y axes d) None of these
- h) If the two tangents at the point are real & distinct, the double point is called
- a) a node b) a cusp c) a conjugate point d) None of these
- i) The series $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots$ represents expansion of
- a) $\sin x$ b) $\cos x$ c) $\cosh x$ d) $\sinh x$
- j) If $y = \cos^{-1} x$, then $x = \dots$
- a) $1 - \frac{y^2}{2!} + \frac{y^4}{4!} - \dots$ b) $1 + \frac{y^2}{2!} + \frac{y^4}{4!} + \dots$ c) $y - \frac{y^3}{3!} + \frac{y^5}{5!} - \dots$ d) None of these



- Q-5** **Attempt all questions** (14)
- A** Trace the curve (**Cardioid**) $r = a(1 + \cos \theta)$. (07)
- B**
- i) Test the convergence of the series $\frac{2}{1} + \frac{3}{8} + \frac{4}{27} + \dots + \frac{n+1}{n^3} + \dots$ (04)
- ii) Test the convergence of the series (03)
- $$\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \dots + \frac{1}{(2n-1)(2n+1)} + \dots$$
- Q-6** **Attempt all questions** (14)
- A**
- (i) Test the convergence of the series $\frac{1}{1+3} + \frac{2}{1+3^2} + \frac{3}{1+3^3} + \dots$ (05)
- (ii) Test the convergence of the series $\sum_{n=1}^{\infty} \frac{1}{n^{\frac{3}{2}}}$. (02)
- B** Find the radius of convergence & interval of convergence of the series (07)
- $$\sum_{n=0}^{\infty} \frac{(-3)^n x^n}{\sqrt{n+1}}$$
- Q-7** **Attempt all questions** (14)
- A**
- (i) If $u = \log(x^3 + y^3 - x^2y - xy^2)$, then Prove that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y}\right)^2 u = -\frac{4}{(x+y)^2}$. (05)
- (ii) Find the values of $\frac{\partial f}{\partial x}$ & $\frac{\partial f}{\partial y}$ at the point (4,-5).if $f(x, y) = x^2 + 3xy + y - 1$. (02)
- B**
- (i) If $u = \sin^{-1}\left(\frac{x+y}{\sqrt{x} + \sqrt{y}}\right)$. Prove that (07)
- a) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{1}{2} \tan u$
- b) $x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} = \frac{1}{4} (\tan^3 u - \tan u)$.
- Q-8** **Attempt all questions** (14)
- A**
- (i) Find Maxima & Minima of the function $x^3 + y^3 - 3x - 12y + 20$. (05)
- (ii) If $x = r \cos \theta$, $y = r \sin \theta$ then find $\frac{\partial(x, y)}{\partial(r, \theta)}$. (02)
- B**
- (i) Expand $f(x, y) = e^x \cos y$ in powers of x & y up to second degree. (05)
- (ii) Find the equations of tangent plane & normal line at the point (-2,2,-3) to the ellipsoid $\frac{x^2}{4} + y^2 + \frac{z^2}{9} - 3 = 0$ (02)

