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July 2013

Bachelor of Computer Application (BCA) Examination

II Semester

Mathematics - II

Time : 3 Hours] [Max. Marks : 40

Note : *All questions are compulsory and carry equal marks. Solve any two parts from each question.*

1. (a) Trace the curve $y = x^3$

(b) Test the convergence of $\int_0^\infty \frac{\cos x}{1+x^2} dx$.

(c) Trace the curve $r = a(1 + \cos\theta)$.

2. (a) Prove that :

$$B(m, n) = \frac{\Gamma m \Gamma n}{\Gamma(m+n)} \quad (m, n > 0).$$

(b) Show that whole lengths of the curve $x = a\cos^3 t$, $y = a\sin^3 t$ is 6a.

(c) Prove that :

$$\Gamma n \Gamma(1-n) = \frac{\pi}{\sin n\pi} \quad 0 < n < 1.$$

3. (a) Evaluate :

$$\int_{-c}^{c} \int_{-b}^{b} \int_{-a}^{a} (x^2 + y^2 + z^2)\, dz\, dy\, dx.$$

(b) If $\vec{r}(t) = 5t^2 i + tj - t^3 k$, show that :

$$\int_1^2 \left(\vec{r} \times \frac{d^2\vec{r}}{dt^2}\right) dt = 14i + 75j - 15k.$$

(c) Show that :

$$\iint_S (axi + byj + czk).\hat{n}\, dS = \frac{4}{5}\pi(a + b + c)$$

Where S is the surface of shphere $x^2 + y^2 + z^2 = 1$.

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4. (a) If $u = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$ then show that :

$$X \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u.$$

(b) Expand $f(x, y) = x^2y + 3y - 2$ in powers of $(x - 1)$ and $(y + 2)$.

(c) Examine the continuity of the function at (0, 0) where :

$$F(x, y) = \begin{cases} \frac{xy}{\sqrt{x^2 + y^2}} & ; \ (x,y) \neq (0,0) \\ 0 & ; \ (x,y) = (0,0) \end{cases}$$

5. (a) Show that series $\sum_{n=0}^{\infty} \frac{1}{n^p}$ is convergent if $p > 1$ and divergent if $p \leq 1$.

(b) Discuss the maxima and minima of :
$u = ax^3 y^2 - x^4y^2 - x^3y^3$

(c) Test the convergence of series :

$$\frac{1}{1.2.3} + \frac{3}{2.3.4} + \frac{5}{3.4.5} + \ldots\ldots$$

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