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May 2015

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 $y^2 (a - x) = x^2 (a + x)$.

   (b) Trace the curve $r = a (1 + \cos 0)$.

   (c) Test the convergence of $\int_0^2 \frac{\log x}{\sqrt{2-x}} dx$.

2. (a) Prove that $B (m, n) = \int_0^\infty \frac{x^{n-1}}{(1+x)^{m+n}} dx$.

   (b) Prove that $\int_0^\infty \frac{x^c}{c^x} dx = \frac{\lceil c+1}{(\log c)^{c+1}}$ $(c>1)$.

   (c) Find the entire length of the cardiod $r = a (a + \cos \theta)$.

3. (a) Evaluate $\int_0^1 \int_0^{\sqrt{1+x^2}} \frac{dx\,dy}{1+x^2+y^2}$.

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

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

   (c) Show that $\iint_S (axi + byj + czk)_0 \hat{n}\, dS = \frac{4}{3}\pi (a+b+c)$.

   where S is the surface of the sphere $x^2 + y^2 + z^2 = 1$..

4. (a) If $u = e^{xyz}$, show that $\frac{\partial^3 u}{\partial x \partial y \partial z} = (1 + 3xyz + x^2y^2z^2)e^{xyz}$

   (b) Expand $f (x, j) = x^2 + xy + y^2$ in powers of $(x - 2)$ and $(y - 3)$ by Taylor's expansion.

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(c) Let $f(x,y) = \begin{cases} \dfrac{xy}{\sqrt{x^2+y^2}} & ; \quad (x,y) \neq (0,0) \\ 0 & ; \quad (x,y) = (0,0) \end{cases}$

Show that f(x,y) is continuous but not differentiable at (0, 0),

5. (a) Discuss the maxima and minima of the function $u(x, y) = x^3y^2 (1 - x - y)$.

(b) Test for convergence of the following series :

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

(c) Test the convergence of the series :

$$2x+\frac{3x^2}{8}+\frac{4x^3}{27}+\ldots..+\frac{(n+1)x^n}{n^3}+\ldots.,x>0.$$

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