

August 2012

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  $x^3 + y^3 = 3axy$ .  
(b) Test the convergence of :  

$$\int_0^{\pi/2} \log \sin x \, dx$$
- (c) Trace the curve  $r^2 = a^2 \sin 2\theta$ .
2. (a) Prove that :  $\sqrt{1/2} = \sqrt{\pi}$ .  
(b) Prove that :  

$$\int_0^{\infty} \frac{x^c}{c^x} dx = \frac{\sqrt{c+1}}{(\log c)^{c+1}}, c > 1.$$
- (c) Prove that intrinsic equation of the parabola  $3ay^2 = 2x^3$  is  $9s = 4a (\sec^2 \Psi - 1)$ .
3. (a) Evaluate :  $\int_0^1 \int_0^1 \int_0^1 e^{x+y+z} dx dy dz$ .  
(b) if  $\vec{r} \times \vec{dr} = \vec{0}$  then show that  $z \hat{r} = \text{constant}$ .  
(c) Verify Stokes theorem for  $\vec{F} = (x^2 + y^2) \hat{i} - 3xy \hat{j}$  taken rounded the rectangle bounded by  $x = \pm a, y = 0, y = b$ .
4. (a) If  $u = \log \frac{x^4 + y^4}{x+y}$  then prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 3$ .  
(b) Investigate the continuity of the function :  

$$f(x, y) = \begin{cases} \frac{xy^2}{x^2 + y^2} & ; (x, y) \neq (0, 0) \\ 0 & ; (x, y) = (0, 0) \end{cases}$$
- (c) State and prove mean value theorem for a function of two variables.
5. (a) Find the maximum and minimum value of the function  $f(x, y) = xy (a - x - y)$ .  
(b) Find the maxima and minima of  $u = x^2 + y^2 + z^2$  where  $ax^2 + by^2 + cz^2 = 1$ .  
(c) Test the convergence of the series :  

$$\frac{x}{1.2} + \frac{x^2}{2.3} + \frac{x^3}{3.4} + \frac{x^4}{4.5} + \dots \text{ where } x > 0.$$

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