

13. Find the image of the point (1, 3, 4) in the plane  $2x - y + z + 3 = 0$

14. If  $\theta = t^n e^{-t^2/4t}$ , what value of n will make  $\frac{1}{r^2} \frac{\partial}{\partial r} \left( r^2 \frac{\partial \theta}{\partial r} \right) = \frac{\partial \theta}{\partial t}$ ?

15. (a) If R and S be two equivalence relation in A. Then prove that  $R \cap S$  be also an equivalence relation in A.

(b) If  $f(x)$  is defined on  $[0,1]$  by the rule

$$f(x) = \begin{cases} x & \text{if } x \in Q \\ 1-x & \text{if } x \notin Q \end{cases}$$

Prove that  $f \circ f(x) = x, \forall x \in [0,1]$

Roll No.....

### BCA-205 (N) B.C.A. (Semester-II) Examination-2014 (New Course)

Paper: Fifth  
Mathematics-II

Time: Three Hours] [Maximum Marks: 75

Note: Section A is compulsory. Attempt any seven questions from Section B and attempt any one question from Section C.

#### Section-A

Note: All questions are compulsory. Each question carries 8 marks. (8x2=16)

1. (a) If  $U = \log(x^3 + y^3 + z^3 - 3xyz)$ , Show that

$$\left( \frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z} \right)^2 U = \frac{-9}{(x+y+z)^2}$$

(b) Evaluate  $\iint (x^2 + y^2) dx dy$  over the region in the positive quadrant for which  $x + y \leq 1$



2. (a) Define Lattice. Show that the set L of all factors of 24 under divisibility forms a lattice.  
(b) State and prove Demorgan's laws.

## Section-B

## (Short Answer Type Questions)

Note: Attempt any seven questions. Each question carries 6 marks. (7x6=42)

3. Prove that if  $f: A \rightarrow B$  is one-one on to mapping then  $f^{-1}: B \rightarrow A$  will be one-one onto mapping.
4. Consider the set  $N \times N$  the set of ordered pairs of natural numbers. Let R be a relation in  $N \times N$  which is defined by  $(a, b)R(c, d)$  iff  $ad = bc$ . Prove that R is an equivalence relation.
5. Show that dual of a lattice is a lattice.
6. Examine  $f(x, y) = xy + \frac{a^3}{x} + \frac{a^3}{y}$  for maximum and minimum value.
7. The projections of a line on axis are 5, 10, 10. Find the length and direction cosines.

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8. Evaluate  $\int_0^1 \int_0^{\sqrt{1+x^2}} \frac{xdxdy}{1+x^2+y^2}$
9. Find the equation to the sphere through the circle  $x^2 + y^2 + z^2 = 9$ ,  $2x + 3y + 4z = 5$  and the point (1, 2, 3)

10. Change the order of integration in  $\int_0^1 \int_{\sqrt{x}}^1 e^{x/y} dx dy$  and hence find its value.

11. In a class of 25 students, 12 have taken mathematics, 8 have taken mathematics but not Biology. Find the number of students who have taken Mathematics and Biology and those who taken Biology but not Mathematics.

12. If  $f(x) = \log\left(\frac{1+x}{1-x}\right)$ , then show that  $f\left(\frac{2x}{1+x^2}\right) = 2f(x)$

## Section-C

## (Long Answer Type Questions)

Note: Attempt any one question. Each question carries 17 marks. (17x1=17)

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