

[4]

BCA-205(N)

15. (a) Find the points in which the line

$$\frac{x+1}{-1} = \frac{y-12}{5} = \frac{z-7}{2} \text{ cuts the surface}$$

$$11x^2 - 5y^2 + z^2 = 0.$$

- (b) Find the volume of tetrahedron bounded by the co-ordinate planes and the plane $x + y + z = 1$.

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B-50

3200

Roll No.

BCA-205(N)

B. C. A. (Second Semester)

EXAMINATION, 2016

(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.

Inst.: The candidates are required to answer only in serial order. If there are many parts of a question, answer them in continuation.

Section—A

8 each

1. (a) If $u = (lx + my + nz)^2 - (x^2 + y^2 + z^2)$ and $l^2 + m^2 + n^2 = 1$, show that :

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = 0$$

- (b) Find the equation of plane through $(1, 1, -1)$ and $(1, -1, 1)$ and perpendicular to the plane $x + 2y + 2z = 5$.

B-50

P. T. O.

[2]

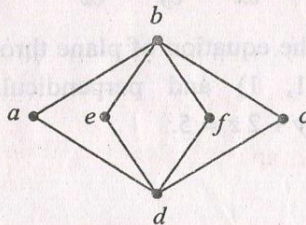
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2. (a) Evaluate $\iint xy(x+y) dx dy$ over the area between $y = x^2$ and $y = x$.
- (b) Discuss maximum and minimum of function $x^3 + y^3 - 6xy$.

Section—B

6 each

3. Prove that $A - B = B' - A'$ where A and B are any two non-empty sets and A' denotes complement of set A.
4. Let :
 $A = \{1, 2, 3, 4\}$ and $R = \{(1, 2), (2, 3), (3, 4), (2, 4)\}$.
 Find transitive closure of R.
5. Find the equation of sphere through point (2, 1, 3) and the circle $x^2 + y^2 = 4, z = 0$.
6. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = 1 + x^2$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ by $g(x) = \log(x)$. Find (a) $f \circ g$ (b) $f \circ f$, where $\mathbb{R}$ is set of real numbers.
7. If $y = f(x) = \left(\frac{2x-1}{5x-2} \right)$, prove that $f(y) = x$.
8. Define POSET. Draw Hasse diagram (A, /) where $A = \{3, 4, 12, 24, 48, 72\}$ and the relation '/' is a/b if a divides b .
9. Show that the lattice L represented by diagram is complemented but not distributive.



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10. Find direction cosines l, m, n of two line which are connected by relation :

$$l - 5m + 3n = 0$$

$$7l^2 + 5m^2 - 3n^2 = 0$$

11. If:

$$u = \sin^{-1} \left(\frac{x^3 + y^3}{x + y} \right)$$

then show that :

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2 \tan u$$

12. The mid-points of sides of triangle are (1, 5, -1), (0, 4, -2) and (2, 3, 4). Find the vertices of triangle.

Section—C

17 each

13. (a) If $u = f(y - z, z - x, x - y)$ prove that :

$$\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$$

- (b) Find the points on $z^2 = xy + 1$ nearest to origin.

14. (a) Prove that if R is an equivalence relation on set A, then R^{-1} is also an equivalence relation on A.

- (b) Let R be equivalence relation on set of integers $\mathbb{Z}$ as $R = \{(x, y) : x - y \text{ is divisible by } 3\}$. Prove that R is an equivalence relation.