

Roll No. .

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BCA-205(N)

## BCA-205(N)

### B. C. A. (Second Semester) EXAMINATION, May, 2018

(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 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  $u = e^{xyz}$ , show that :

$$\frac{\partial^3 u}{\partial x \partial y \partial z} = (1 + 3xyz + x^2 y^2 z^2) e^{xyz}$$

(b) Show that the lines whose direction cosines are given by the equations  $2l + 2m - n = 0$  and  $mn + nl + lm = 0$  are at right angle.

(B-57) P. T. O.

2. (a) Discuss the maxima or minima of the function :

$$u = x^3 - y^3 - 3x$$

(b) Evaluate : <http://csjmuonline.com>

$$\int_0^1 \int_0^x e^x dx dy$$

Section—B

6 each

3. For any set A, B and C show that :

$$A - (B \cup C) = (A - B) \cap (A - C)$$

4. If R be a relation in the set of integer I defined by  $R = \{(x, y) : x \in I, y \in I, x - y = 5k \text{ or } x - y \text{ is divisible by } 5\}$ . Prove that R is an equivalence relation.

5. In a group of 25 people, 12 speak Hindi, 4 speak both English and Hindi and all people speak at least one of the two languages. How many people only English not Hind ? How many speak English ?

6. A plane meets the co-ordinate axes in A, B and C such that the centroid of triangle ABC is the point  $(a, b, c)$ .

Show that the equation of the plane is  $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 3$ .

7. If  $u = \tan^{-1} \left( \frac{x^3 + y^3}{x + y} \right)$ , show that :

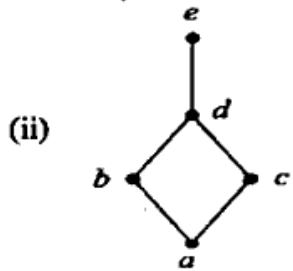
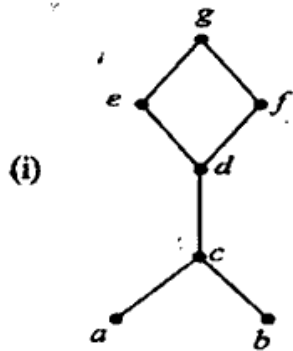
$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$$

8. Evaluate the following triple integral :

$$\int_{x=0}^2 \int_{y=0}^3 \int_{z=0}^1 (x + y + z) dx dy dz$$

(B-57)

9. Determine whether the following Hasse diagrams represent lattice or not :



10. Change the order of integration in the double integral

$$\int_0^a \int_y^a \frac{x}{x^2 + y^2} dy dx \text{ and evaluate.}$$

11. 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).

12. Define distributive lattice and prove that in a distributive lattice, if an element has a complement, then this complement is unique.

(B-57) P. T. O.

Section—C

17 each

13. (a) Let  $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$  and  $R$  be the relation on  $A \times A$  defined as  $(a, b) R (c, d)$  if  $a + d = b + c$ . Prove that  $R$  is an equivalence relation.
- (b) Prove that if  $f: A \rightarrow B$  is one-one onto mapping, then  $f^{-1}: B \rightarrow A$  will be one-one onto mapping.

14. (a) If:

$$z = e^u f(v)$$

$$u = ax + by$$

$$v = ax - by$$

show that :

$$b \frac{\partial z}{\partial x} + a \frac{\partial z}{\partial y} = 2 abz$$

- (b) Find the image of the point (1, 3, 4) in the plane  $2x - y + z + 3 = 0$ .
15. (a) Prove that the lines :

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$$

and  $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$

are coplanar, find their point of intersection. Also find the equation to the plane containing them.

- (b) Find the area of between the parabolas  $y^2 = 4ax$  and  $x^2 = 4ay$ .

BCA-205(N)

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(B-57)