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(Printed Pages 4)

(20525)

Roll No.

BCA- II Sem.

18010

B.C.A. Examination, May-2025

MATHEMATICS-II

[BCA-201]

Time : Three Hours] *[Maximum Marks : 75*

Note : Attempt questions from **all** the sections as per instructions.

Section-A

(Very Short Answer Type Questions)

Note : Attempt all the **five** questions. Each question carries **3** marks.

1. Which of the following sets are finite and which are infinite: 3

   (i) The set of the natural numbers divisible by 2.

   (ii) The set of natural numbers less than 10.

   (iii) The set of lines passing through a point.

P.T.O.

2. If $f:A\to B$ such that $f(x)=2x+1$ and $g: B\to C$ such that $g(y)=y^2$, find $fog(y)$. 3

3. Draw the Hasse diagram of $(P(A),\subseteq)$ for $A=\{a,b\}$. 3

4. If $u = \dfrac{x^{1/4}+y^{1/4}}{x^{1/5}+y^{1/5}}$, then evaluate - 3

   $\left(x\dfrac{\partial u}{\partial x}+y\dfrac{\partial u}{\partial y}\right)$.

5. Find the coordinates of a point which divides the join of (2,3,4) and (3,−4,7) in the ratio 2:−4. 3

Section-B

(Short Answer Type Questions)

Note : Attempt any **two** questions. Each question carries **7½** marks.

6. If $f(x) = \log\left(\dfrac{1+x}{1-x}\right)$, then show that

   $f(x)+f(y) = f\left(\dfrac{x+y}{1+xy}\right)$ 7½

7. Prove that the dual of a lattice is a lattice. 7½

8. If $u=f(x-y,\ y-z,\ z-x)$, then prove that

   $\dfrac{\partial u}{\partial x}+\dfrac{\partial u}{\partial y}+\dfrac{\partial u}{\partial z}=0$ 7½

Section-C

(Long Answer Type Questions)

Note : Attempt any **three** questions. Each question carries **15** marks.

9. (a) In a class of 120 students, 80 have take mathematics, 40 have taken both mathematics and statistics and all students have taken at least one of the two subjects. Find 7½

   (i) How many students have taken only statistics and not mathematics?

   (ii) How many students have taken statistics?

   (b) If R={(1,1), (2,2), (2,3), (3,2), (4,2), (4,4)} be the relation in A={1,2,3,4}. Determine whether the relation R is reflexive, symmetric and transitive. 7½

10. (a) If L be a lattice, then prove that $a \wedge b = a$ if and only if $a \vee b = b$. 7½

   (b) Show that the poset $(S_{30}, /)$ is a lattice. Also draw the Hasse diagram. 7½

11. (a) If $u = x^2y + y^2z + z^2x$, then prove that
$$\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = (x+y+z)^2$$ 7½

   (b) Find the maximum and minimum values of $f(x,y) = xy(a-x-y)$. 7½

12. (a) A line makes angles $\alpha, \beta, \gamma, \delta$ with the four diagonals of a cube, prove that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = \frac{4}{3}$. 7½

   (b) Find the equation of the plane which passes through the points A(0,1,1), B(1,1,2) and C(−1,2,−2). 7½

13. (a) Find the area of a plate in the form of a quadrant of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ by double integration. 7½

   (b) Find the volume of the tetrahedron bounded by the plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ and the coordinate plane. 7½