A (Printed Pages 4)

(20622) Roll No. ....

BCA - II Sem.

18010

B.C.A. Examination, June-2022

MATHEMATICS-II

[BCA-201]

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

Note : Attempt ***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. Define sets and Universal sets with example.

2. Define *equivalence* Relation and show that the relation $S=\{(a,b):a \geq B\}$ on the set R of real no is an equivalence relation.

P.T.O.

3. Show that the inclusion relation $\subseteq$ is a partial ordering on the power set of a set S.

4. If $Z=e^{xy}$, $x=t\cos t$, $y=t\sin t$ compute $\frac{dz}{dt}$ at $t=\frac{\pi}{2}$.

5. If $\cos\alpha$, $\cos\beta$, and $\cos\gamma$ are the direction cosines of a straight line then prove that $\sin^2\alpha+\sin^2\beta+\sin^2\gamma=2$

Section-B

(Short Answer Type Questions)

Note : Attempt any **two** questions out of the following three questions. Each questions carries 7½ marks.

6. Show that Dual of a complemented lattice is complemented.

7. Find the equations of the straight line drawn through the origin which will intersect both the lines.
$$\frac{x-1}{1}=\frac{y+3}{4}=\frac{z-5}{3} \text{ and } \frac{x-4}{2}=\frac{y+3}{3}=\frac{z-14}{4}$$

8. Show that $f(x,y,z)=(x+y+z)^3-3(x+y+z)-24xyz+a^3$ has maxima at (1,1,1)

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Section-C

(Long Answer Type Questions)

Note : Attempt any **three** questions out of the following five questions. Each questions carries 15 marks:

9. Let the function $f: R \rightarrow R$ and $g: R \rightarrow R$ be defined by $f(x) = 2x,\ g(x) = x + 2 \ \forall\, x \in R$.

   (a) Check the function f and g for being.

   (i) One -to-One (ii) Onto

   (b) Find the formulac defining the function fog and gof and obtain the values of (fog) (2) and (gof) (*I*).

10. (a) If $(L, \leq)$ is a lattice and a,b,c and d $\in L$ then .

    (i) $a \leq b, c \leq d \Rightarrow a \wedge c \leq b \wedge d$

    (ii) $a \wedge (b \vee c) \geq (a \wedge b) \vee (a \wedge c)$

    (b) Show that dual of a lattice is a lattice.

11. (a) Show that f(xy, z−2x)=0, satisfies under suitable conditions, the equation $x\frac{\partial z}{\partial x} - y\frac{\partial z}{\partial y} = 2x$. What are these conditions.

(b) If $z = f\left[\frac{ny-mz}{nx-lz}\right]$ Prove that $(nx-lz)\frac{\partial z}{\partial x} + (ny-mz)\frac{\partial z}{\partial y} = 0$

12. (a) Find the equations of the plane parallel to the plane 2x-3y-5z+1=0 and distant 5 units from the point (-1,3,1).

    (b) Find the equation of the sphere which touches the sphere $x^2+y^2+z^2+2x-6y+1=0$ at (1,2,-2) and passes through the point (1,-1,0).

13. (a) Evaluate the double integral $\int_0^a \int_0^{\sqrt{a^2-x^2}} x^2 y\,dx\,dy$. Also mention the region of integration involved in this double integral. 15

    (b) Evaluate the following integrals by first converting to Polar co-ordinates

    $$\int_{-1}^{1} \int_{-\sqrt{1-x^2}}^{0} \cos(x^2 + y^2)\,dx\,dy$$

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