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(20517) Roll No.......................

BCA-II Sem.

18010

B.C.A. Examination, May 2017

MATHEMATICS - II

(BCA-201)

(New)

Time : Three Hours] *Maximum Marks : 75*

Note : Attempt questions from **all** Sections as per instructions.

Section-A

(Very Short Answer Questions)

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

$3 \times 5 = 15$

1. Let A={2, 3, 5}, B={3, 6, 8} & C={4, 7, 9}. Show that $A \times (B \cap C) = (A \times B) \cap (A \times C)$
2. Let Q be the set of rational numbers. Let f : $Q \rightarrow Q$ be defined by $f(x) = 2x + 3$. Show that f is bijective.

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3. Show that the set of all factors of 12 under divisibility forms a lattice.
4. If $U = f(y/x)$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$
5. Find the direction cosines of the line segment joining the points P(2, 3, -6) and Q(3, -4, 5)

Section-B

(Short Answer Questions)

Note : This section contains **three** questions, attempt any **two** questions. Each question carries 7½ marks. $7\frac{1}{2} \times 2 = 15$

6. Let Z be the set of integers, Define a relation R on I such that xRy if and only if x-y is divisible by $5 \forall x, y \in z$. Show that R is an equivalence relation.
7. Evaluate $\iint r^3 dr d\theta$ over the area bounded between the circles $r = 2\cos\theta$ & $r = 4\cos\theta$
8. Change the independent variable x to z in the equation $(1+x^2)^2\frac{d^2y}{dx^2} + 2x(1+x^2)\frac{dy}{dx} + y = x$ by the substitution $x = \tan z$

Section-C

(Detailed Answer Questions)

Note : This section contains five questions, attempt any **three** questions. Each question carries 15 marks. $15\times3=45$

9. (i) Let $f : R \to R$ and $g : R \to R$ be defined by $f(x) = x - 1$ and $g(x) = x^2 + 1$. Find fog (2), gof(2), fof(2) and gog (2).

   (ii) If R & S be equivalence relations in the set X, then prove that $R \cap S$ is an equivalence relation in X.

10. (i) Let $(L, \leq)$ be a lattice and $a, b, c, d \in L$. Then show that

    (i) $(a \wedge b) \vee (c \wedge d) \leq (a \vee c) \wedge (b \vee d)$

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

    (ii) Show that dual of a complemented lattice is complemented.

11. (i) If $V = f(x-y, y-z, z-x)$, then prove that

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

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   (ii) If $u = \log \frac{x^4 + y^4}{x + y}$, show that

$$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 3$$

12. (i) Find the equation to the plane passing through the four points (0, -1, -1), (4, 5,1), (3,9,4), (-4, 4, 4)

    (ii) Find the equation of the sphere which passes through the points (1, -3, 4), (1, -5, 2), (1, -3, 0) and whose centre lies on the plane $x + y + z = 0$

13. (i) Evaluate the double integral

$$\int_{-a}^{a} \int_{-\frac{b}{a}\sqrt{a^2-x^2}}^{\frac{b}{a}\sqrt{a^2-x^2}} (x+y)^2 \, dx\,dy$$

    (ii) Evaluate the triple integral $\iiint (x^2+y^2+z^2)\, dx\, dy\, dz$ where R denotes the region bounded by $x=0$, $y=0$, $z=0$ and $x+y+z=a$, $a>0$

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