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(Please write your Exam Roll No.) **Exam Roll No.** 061

END TERM EXAMINATION

SECOND SEMESTER [BCA] MAY-JUNE-2009

Paper Code: BCA102	**Subject: Mathematics-II**
Paper Id-20102	(Batch 2005-2008)
Time : 3 Hours	**Maximum Marks :75**

Note: Q.1 is compulsory. Attempt any one question from each Unit.

Q1 (a) Let S be any non empty set and P(s) be the power set of S. If '$\subseteq$' is a relation defined on P(S), then show that $(P(S), \subseteq)$ is a poset.

(b) If R and S be relations from the set A to B, then show that $(R \cup S)^{-1} = R^{-1} \cup S^{-1}$.

(c) Test whether $f(x) = x^2 + 1$ from the set of positive real numbers to the set of positive real numbers is (i) one-one (ii) onto.

(d) Draw the Hasse diagram $[D_{20}, 1]$.

(e) Find the angle between the line $\frac{x-3}{2} = \frac{y-1}{4} = \frac{z-2}{3}$ and the plane x-y+2z=3.

(f) Evaluate $\int\int xy\,dx\,dy$ over the region in the positive quadrant for which $x + y \le 1$

(g) If A={4,5,7,8,10}, B={4,5,9} verify that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

(h) Show by double integration the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $\frac{16}{3}a^2$.

(i) Give all partitions of S={2,3,4}.

(j) What is the shortest distance between two given lines? Also, give the equations of shortest distance. **(10x2.5=25)**

UNIT-I

Q2 (a) If A={1,2,3}, B={4,5} and C={1,2,3,4,5} find (i) AXB (ii) CXB (iii)BXB. Prove that (CXB)-(AXB)=BXB. **(6)**

(b) In a group of students, 70 have a personal computer, 120 have a personal stereo and 41 have both. How many own at least one of these devices? Draw an appropriate Venn diagram. **(6.5)**

Q3 (a) Define Partial Order Relation. Is the greater or equal ($\ge$) relation on the set of integers Z a partial order relation. Prove it. **(6)**

(b) A function f on the set R of real numbers in defined on:

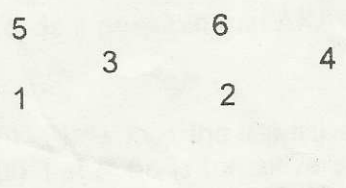
$$f(x) = \begin{matrix} 2x+1 & for & 0 \le x < 2 \\ x-2 & for & 2 \le x \le 5 \end{matrix}$$

. Find (i) the domain of f. (ii) the image of f. (iii) whether the function is one to one or many one. **(6.5)**

UNIT-II

Q4 (a) Define principle of duality, complete lattice and distributive lattice. **(6)**

(b) Let S={1,2,3,4,5,6} be ordered on in the figure given below: **(6.5)**



$y^2 = 4ax$

$x^2 = 4a\sqrt{4ax}$

$x^2 = 8a\sqrt{ax}$

$x^4 = (8a)^2 ax$

P.T.O.

Find (i) All minimal and maximal elements of S.
(ii) Greatest and least element.
(iii) All linearly ordered subset with three or more elements.

Q5 (a) Prove that product of two lattices is a lattice. **(6)**
(b) Determine whether D_{12} is a finite Boolean Algebra or not. **(3)**
(c) Find the complement of each element of D_{42}. **(3.5)**

UNIT-III

Q6 (a) Find the equation of the plane passing though the line of intersection of the planes 3x-4y+2z=0 and 2x+3y-5z=6 and perpendicular to the plane x+2y-z=9. **(6)**

(b) If $U = \log\sqrt{x^2+y^2+z^2}$, show that $(x^2+y^2+z^2)\left(\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+\frac{\partial^2 u}{\partial z^2}\right)=1$. **(6.5)**

Q7 (a) Define chain rule of partial derivations. **(2)**
(b) Find $\frac{du}{dt}$, when $u = xy^2 + x^2y$, $x = at^2$, $y = 2at$. **(4)**
(c) Examine the function $Z = f(x,y) = y^3 - x^2 + 6x - 12y + 5$ for relative extrema. **(3)**
(d) Show that the plane ax+by+cz+d=0 touches the surface $px^2 + qy^2 + 2z = 0$. If $\frac{a^2}{p}+\frac{b^2}{q}+2cd=0$. **(3.5)**

UNIT-IV

Q8 (a) Find the volume generated by revolving the area bounded by the curve $y=4x-x^2$ and the x-axis about the line y=6. **(6.5)**
(b) Find the area of the region bounded by $y=x^2+1$, y=x, x=0 and y=2. **(6)**

Q9 Evaluate $\iint r\sin\theta\, dr\, d\theta$ over the cardiode $r = a(1-\cos\theta)$ above the initial line. **(12.5)**

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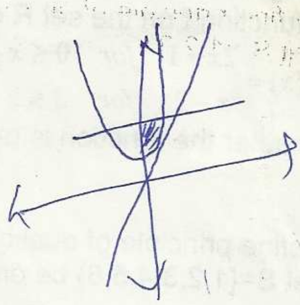

$x^2\frac{\partial^2 u}{\partial x^2} + y^2\frac{\partial^2 u}{(\partial x)^2}$