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END TERM EXAMINATION

SECOND SEMESTER [BCA] MAY-2008

Paper Code: BCA102	*Subject: Mathematics-II*
Paper Id: 20102	*(Batch: 2005-2007)*
Time : 3 Hours	*Maximum Marks :75*

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

Q1 (a) Give all partitions of S={2,3,4}. **(2)**

(b) Let $f(x)=x^2-2$, $g(x)=3x$ and $h(x)=(x+1)^2$ be functions on R. Find goh, f^2og, g^3. **(3)**

(c) Let A={2,3,7,8}, B={1,3,5}, C={3,5,9,11} find (i) B⊕C (ii) (A-B)∪(B-C) (iii) (AxB)∩(BxB). **(3)**

(d) Give an example of a relation which is (i) neither symmetric nor anti-symmetric (ii) not irreflexive. **(3)**

(e) Give a topological sorting of the poset $(D_{24}, |)$, where D_n denotes the set of all positive divisors of and | denote divides. **(3)**

(f) Give an example of an infinite lattice with finite length. **(2)**

(g) 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. **(3)**

(h) What is the shortest distance between two given lines? Also, give the equations of shortest distance. **(3)**

(i) Change the order of integration in $I=\int_0^{2a}\int_{x^2/4a}^{3a-x} f(x,y)dxdy$. **(3)**

SECTION-A

Q2 (a) Using set theory, prove the identity (AxB)∩(PxQ)=(A∩P)x(B∩Q). **(6.5)**

(b) Find whether the function f:N→N defined by $f(n)=n^2+n+1$ is invertible or not. **(6)**

Q3 (a) Given A={1,2,3,4,5,6}. Let R be a relation on A defined as R={(x,y); x+y is a divisor of 24} **(6.5)**

(i) Determine the matrix of relation R.

(ii) Find the composition R_0R.

(iii) Find the domain and range of R.

(iv) Compute transitive closure of R.

(b) Find the domain and range of the functions (i) $f(x)=\frac{1}{\sqrt{x-2}}$ (ii) $f(x)=\frac{|(x-3)|}{(x-3)}$ **(6)**

SECTION-B

Q4 (a) Consider the poset ({{1}, {2}, {4}, {1,2}, {1,4}, {2,4}, {3,4}, {1,3,4}, {2,3,4}}, ⊆) **(6.5)**

(i) Find all maximal and minimal elements.

(ii) Find the first and last elements.

(iii) Find all the upper bounds of {{2}, {4}} and its supremum, if it exists.

(iv) Find all the lower bounds of {1,3,4} and its infimum, if it exists.

(b) In a distributive lattice, if an element has a complement then this complement is unique. **(6)**

Q5 (a) Consider a relation R on the set Z of all integers as follows aRb⇔a+b is even for all a, b∈Z. Is R a partial order relation? Prove or give a counter example. **(4)**

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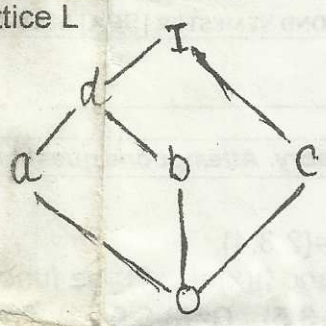
(b) Give an example of a relation, on the set {1,2,3} which is both a partial ordering and an equivalence relation. **(2.5)**

(c) Consider the bounded lattice L **(6)**



(i) Find all join-irreducible elements.
(ii) Find the atoms.
(iii) Is L complemented?
(iv) Is L distributive?

SECTION-C

Q6 (a) If $u = \sin^{-1}\left\{\frac{x^{1/3}+y^{1/3}}{x^{1/2}+y^{1/2}}\right\}^{1/2}$ then show that

(i) $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{-1}{12}\tan u$

(ii) $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = \frac{\tan u}{144}(13+\tan^2 u)$ **(6.5)**

(b) Find the equations of the spheres through the circle $x^2+y^2+z^2=5$, $x+2y+3z=3$ and touching the plane $4x+3y=15$. **(6)**

Q7 (a) Find the maxima and minima of the function $f(x,y)=x^3+y^3-63(x+y)+12xy$. **(6.5)**

(b) Show that the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $4x-3y+1=0=5x-3z+2$ are coplanar. Also find their point of intersection. **(6)**

SECTION-D

Q8 By changing to polar co-ordinates evaluate $\iint_R (x^2+y^2)\,dx\,dy$ where R is the region in xy-plane bounded by $x^2+y^2=4$ and $x^2+y^2=9$. **(12.5)**

Q9 Find the volume of the sphere $x^2+y^2+z^2=a^2$. **(12.5)**

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