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END-TERM EXAMINATION

SECOND SEMESTER [BCA] – MAY-JUNE 2006

Paper Code: BCA- 102	*Subject: Mathematic- II*
Paper ID: 20102	

Time : 3 Hours *Maximum Marks : 75*

Note: Question no. 1 is compulsory. Answer one question from each unit.

Q1. (a) A set is called odd (respectively, even) set if the number of elements in it is odd (respectively, even).
(i) How many odd sets of {1,2,3,.........n} are there? **(1.5)**
(ii) How many even sets of {1,2,3, ...n} are there? **(1.5)**
(b) Compute the transitive closure of R={(1,2),(2,3),(3,4),(4,5)} on {1,2,3,4,5}. **(3)**
(c) Give an example of a two variable function which is continuous at (1,1) but is not differentiable there. **(3)**
(d) Test whether $f(x)=x^2+1$ from the set of positive real number to the set of positive real number is (i) one-one, (ii) onto. **(3)**
(e) Check whether (P(S), $\subset$) is a lattice, where S is a finite set and P(S) is the poer set of S. **(3)**
(f) State Euler's Theorem. **(3)**
(g) Find the shortest distance from the point (2,4,1) to the plane 3x+2y+5z=7. **(3)**
(h) Evaluate the double integral $\int_R\int e^{x^2}\,dxdy$, where the region R is given by
R: $2y \le x \le 2$ and $0 \le y \le 1$. **(4)**

SECTION- A

Q2. Prove that every partition of a finite set A gives rise to a unique equivalence relation R on A gives rise to a unique partition of A. **(12.5)**

Q3. (a) Suppose $A \Delta C = B \Delta C$. Does it follow that A=B? Justify your answer. **(6.5)**
(b) Let R={(1,1), (2,2),(3,3),(4,4),(1,2),(2,4),(2,3)} be a relation on {1,2,3,4,5,6}. Compute the
(i) Transitive closure of R
(ii) Largest relation R_1 such that $R_1 \subseteq R$ and R_1 is antisymmetric.
(iii) Largest relation R_1 such that $R_1 \subseteq R$ and R_1 is irreflexive.
(6)

SECTION- B

Q4. (a) Prove that every non-empty POSET (S, $\prec$) has a minimal element. **(6)**
(b) Prove that for every POSET (S, $\prec$), there is a total ordering of S which is compatible to the partial ordering $\prec$. **(6.5)**

Q5. For each of the following posets, draw the Hasse diagram and determine all maximal and minimal elements and greatest and least elements if they exit. Specify which posets are lattices? **(12.5)**
(a) [D_{20}; |], where D_n is the set of all positive divisors of n and | denotes divides.
(b) [D30; |]
(c) [A; $\le$], where A={x | x is a real number and $0 < x \le 1$}.
(d) [A; |], where A={2,3,4,6,8,24,48}.

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SECTION- C

Q6. (a) Check the continuity and differentiability of the following function at (2,3). **(8)**

$$f(x,y)=\begin{cases}\dfrac{(x+1)^2-y^2}{(x+1)-y} & (x,y)\neq(2,3)\\[2ex] 6 & (x,y)=(2,3)\end{cases}$$

(b) ½ Find the equation of the plane which cuts the positive axes at a distance 2 from the origin. **(4.5)**

Q7. (a) 0 3y Find the local minimum and local maximum values of the function $f(x,y) = 2x^2+y^2-2x-2y-4$ over the triangular region bounded by the lines $x = 0$, $y = 0$ and $2x + y = 1$. **(6)**

(b) Find the equation of the circle which passes through the origin, has its center on the line $x + y = 4$ and cuts the circle $x^2 + y^2 - 4x + 2y + 4 = 0$ orthogonally. **(6.5)**

SECTION- D

6

Q8. Find the volume of the ellipsoid $\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}+\dfrac{z^2}{c^2}=1.$ **(12.5)**

Q9. Evaluate the triple integral $\iiint_T y\,dx\,dy\,dz$ where T is the region bounded by the surfaces $x = y^2$, $x = y+2$, $4z = x^2+y^2$ and $z = y+3$.

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$(x-a)^2+(y-b)^2 = x^2$ center