Karunya University
(Karunya Institute of Technology and Sciences)
(Declared as Deemed to be University under Sec.3 of the UGC Act, 1965)

End Semester Examinations - 2015-16 Even Semester - May 2016

14MA2010 Discrete Mathematics

Set B

Time : 3 hrs
Total Marks: 100

1\.

(a).Verify whether $((p \Rightarrow q) \wedge (q \Rightarrow r)) \Rightarrow (p \Rightarrow r)$ is a tautology or not. (5)

(b).Prove by method of induction that $1^2+2^2+\ldots\ldots+n^2 = n(n+1)(2n+1)/6$ (10)

(c) .Let $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$. Compute $A \vee B$, $A \wedge B$, $A \Theta B^T$ (5)

OR

2\.

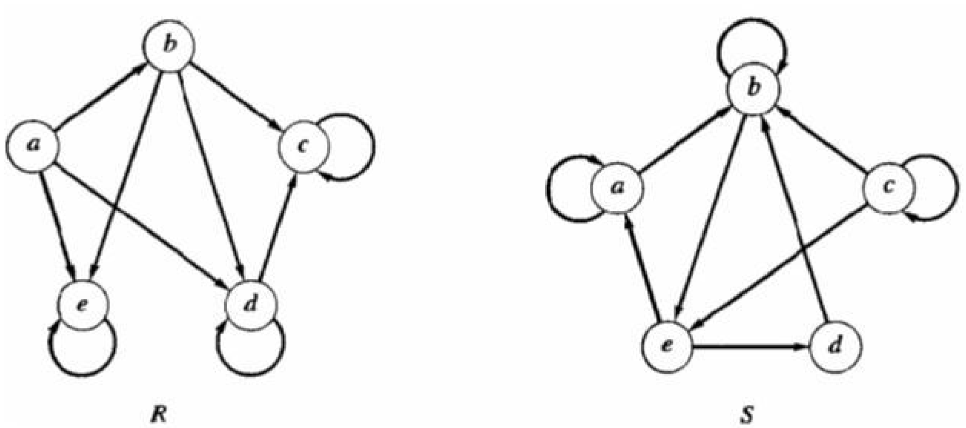
(a). Find the explicit formula for the sequence defined by $C_n=3C_{n-1}-2C_{n-2}$ with initial conditions $C_1=5$ and $C_2=3$ (10)

(b). A survey of 500 TV watchers produced the following information:285 watch football games,195 watch hockey games,115watch basket ball games,45 watch foot ball and basket ball games,70 watch foot ball and hockey games, 50 watch hockey and basket ball games and 50 do not watch any of the 3 games.(i) How many people in the survey watch all the 3 games? (ii) How many people watch exactly one of the games? (10)

3\.

(a).Let S={1,2,3,4} and A={SXS}. Define a relation R on A as (a,b) R (c,d) if and only if $a+b = c+d$ (i) Show that R is an Equivalence relation.(ii) Compute A/R (10)

(b).Let A={a,b,c,d,e} and let R and S be two relations on A whose digraphs are given below. Find (i) $\overline{R}$ (ii) R^{-1} (iii) $R \cap S$ (iv) S^2 (v) R^∞ (10)



OR

4\.

(a).Let A={1,2,3,4,5} and let R={(1,1),(1,2),(2,1),(2,2),(3,3),(3,4),(4,3),(4,4),(5,5)} and S={(1,1),(2,2),(3,3),(4,4),(5,4),(5,5)}. Find $(R \cup S)^\infty$ using Warshall's algorithm. (10)

(b). Let A= B {1,2,3,4 } and R={(1,1),(1,3),(2,3),(3,1),(4,2),(4,4)} and S={(1,2),(2,3),(3,1),(3,2),(4,3)}. Find (i)RoS (ii) SoS and (iii) verify that $(S \circ R)^{-1} = R^{-1} \circ S^{-1}$ (10)

5. (a). Prove that (D_{210} ,/) is a Boolean algebra. (10)

(b). Consider the Boolean polynomial $P(x\ ,y,z)=(x\wedge y^{'})\vee(\ y\wedge(x'\vee y))$. If B ={0,1},Construct the truth table for the Boolean function $f:B_3\ \to B$ defined by P and construct the logic diagram.

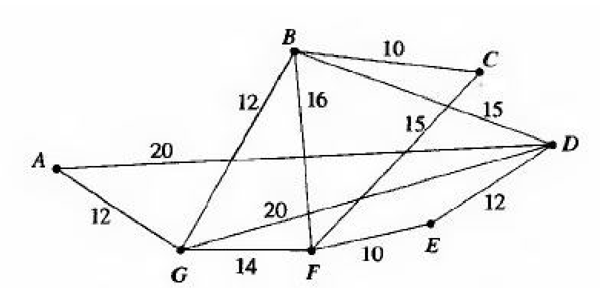
(10)

OR

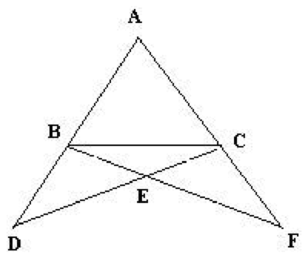
6. (a).Let S={a,b,c} and let A=P(S),Prove that $(P(S),\subseteq)$ is a poset. (10)

(b) .Draw the Hasse diagram of (D_{60} , /). (10)

7. a. Find the minimal spanning tree using Prim's and Kruskal's algorithms for the graph given below. (10)

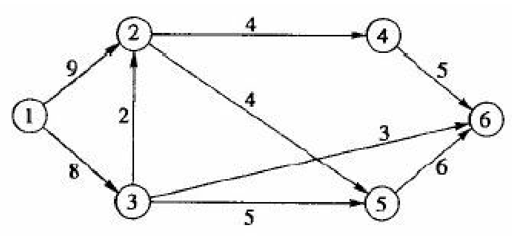


b. Using Fleury's algorithm,construct an Euler circuit for the given graph (10)



OR

8. (a). Using labelling algorithm, find the maximum flow for the network given below. (15)



(b).Let A {v1,v2,v3,v4,v5,v6,v7,v8,v9,v10} and let T={(v2,v3), (v2,v1), (v4,v5), (v4,v6), (v5,v8), (v6,v7), (v4,v2), (v7,v9), (v7,v10)} .(i)Prove that T is a rooted tree and find the root.(ii)Find the height of the tree.(iii) List out all leaves (iv)List out the offsprings of each vertex.(v) Find the subtree T(V_2). (5)

9. (a) Le T be the set of all even integers. Then prove that (Z, +) and (T, +) are isomorphic. (6).

(b) Let $H = \begin{bmatrix} 0 & 1 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (i) Find the encoding function $e_H : B^2 \to B^5$ (ii) Determine whether the encoding function form groupcode. (iii) Find the minimum distance of e. (14)

Wishing you All the Best
