

Code No: R21053

**R10**

**SET - 1**

**II B. Tech I Semester Supplementary Examinations, Oct/Nov- 2017**  
**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE AND ENGINEERING**  
(Com. to CSE, IT, ECC)

Time: 3 hours

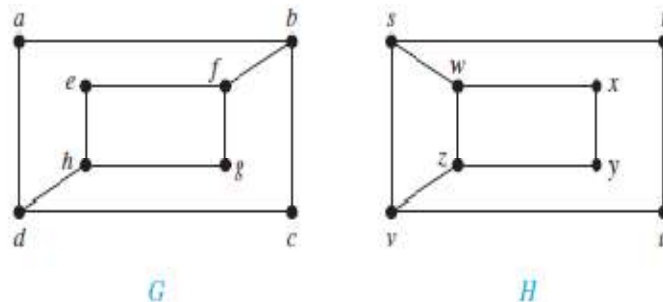
Max. Marks: 75

Answer any **FIVE** Questions  
All Questions carry **Equal** Marks

1. a) Let p, q, and r be the propositions (10M)  
 $p$  : You have the swine flu.  
 $q$  : You miss the final examination.  
 $r$  : You pass the course.  
 Express each of these propositions as an English sentence.  
 i)  $p \rightarrow q$  ii)  $\neg q \leftrightarrow r$  iii)  $q \rightarrow \neg r$  iv)  $p \vee q \vee r$  v)  $(p \rightarrow \neg r) \vee (q \rightarrow \neg r)$   
 vi)  $(p \wedge q) \vee (\neg q \wedge r)$   
 b) Show that  $(p \rightarrow q) \rightarrow (r \rightarrow s)$  and  $(p \rightarrow r) \rightarrow (q \rightarrow s)$  are not logically equivalent. (6M)
2. a) Use Fermat's little theorem to find  $23^{1002} \bmod 41$ . (4M)  
 b) Find the greatest common divisor of 414 and 662 using the Euclidean algorithm (4M)  
 c) Use mathematical induction to prove the inequality  $n < 2^n$  for all positive integers n. (8M)
3. a) In how many ways can the digits 0,1,2,3,4,5,6,7,8 and 9 be arranged so that 0 and 1 are adjacent and in the order of 01. (6M)  
 b) Draw the directed graph that represents the relation  $\{(a, a), (a, b), (b, c), (c, b), (c, d), (d, a), (d, b)\}$ . (4M)  
 c) Let  $R_1$  and  $R_2$  be relations on a set A represented by the matrices below. Find  $R_2 \circ R_1$ . (6M)

$$M_{R_1} = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix} \quad \text{and} \quad M_{R_2} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

4. a) Whether the graphs G and H in the below figure are isomorphic? (8M)



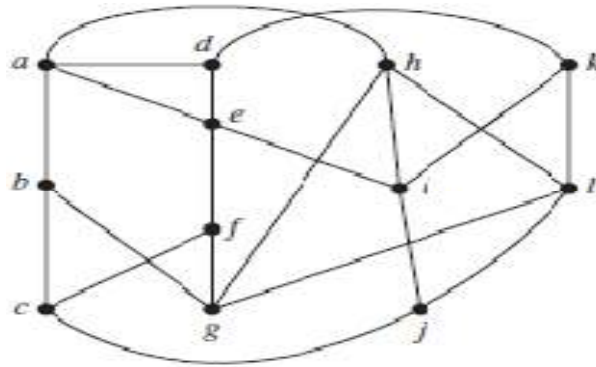
- b) How to determine whether a graph contains Hamiltonian cycle or not, give an example (8M)

Code No: R21053

**R10**

**SET - 3**

5. a) How many edges does a spanning tree of  $K_n$  have (8M)  
b) Find a spanning tree for the graph shown in below figure. (8M)



6. Explain in detail the algebraic systems with two binary operations? (16M)
7. a) How many positive integers between 5 and 31 are divisible by both 3 and 4? (8M)  
What are they?  
b) Determine the coefficient of  $x^5 y^{10} z^5 w^5$  in  $(x-7y+3z-w)^{25}$ . (8M)
8. a) Find the first six terms of the sequence defined by each of these recurrence relations and initial conditions. (8M)  
i)  $a_n = na_{n-1} + a_{n-2}^2, a_0 = -1, a_1 = 0$   
ii)  $a_n = a_{n-1} - a_{n-2} + a_{n-3}, a_0 = 1, a_1 = 1, a_2 = 2$
- b) Find the solution to the recurrence relation  $a_n = 6a_{n-1} - 11a_{n-2} + 6a_{n-3}$  with the initial conditions  $a_0 = 2, a_1 = 5$ , and  $a_2 = 15$ . (8M)