INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

Four Year B.Tech III Semester End Examinations (Supplementary) - July, 2018

Regulation: IARE – R16

DISCRETE MATHEMATICAL STRUCTURES

Time: 3 Hours   (COMMON TO CSE | IT)   Max Marks: 70

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Write each of the following arguments in symbolic form and test the validity of given arguments.
    i. If I join MIT then I will get best education. If I get best education, then I will get job in USA. If I get Job in USA then I will become a millionaire. I joined MIT. I will become millionaire.
    ii. Joy's wallet is in his back pocket or it is on his desk. Joy wallet is not in his back pocket. Therefore Joy wallet is on his desk.

    [7M]

    (b) Explain the principal disjunctive and principal conjunctive normal forms and obtain the principal disjunctive normal form of $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$.

    [7M]

2. (a) List the rules of inference. Show that $\neg (P \wedge Q)$ follows from $negP \wedge \neg Q$ using rules of inference. **[7M]**

    (b) Explain the steps involved in principal conjunctive normal form and obtain the principal conjunctive normal form of $(P \wedge Q) \vee (\neg P \wedge R)$. **[7M]**

UNIT – II

3. (a) Explain different types of functions. Find the inverse of function f(x)= 3x+7. **[7M]**

    (b) Explain properties of relations with examples. **[7M]**

4. (a) Define (i) Sub lattice (ii) Lattice homomorphism (iii) Complete lattice (iv) Distributive lattice
    [7M]

    (b) Let (L,$\leq$) be a lattice, $*$ and $\oplus$ be two operations such that $a * b = \text{glb}\{a, b\}, a \oplus b = \text{lub}\{a, b\}$. Prove that both $*$ and $\oplus$ satisfy Commutative law, Associative law, Absorption law and Idempotent law **[7M]**

UNIT – III

5. (a) A committee is to be chosen from a set of 8 women and 6 men. How many ways are there to form a committee if the committee has (i) 6 people, 3 women and 3 men? (ii) any number of people but equal number of women and men

   [7M]

   (b) Find the number of non-negative integral solutions of $x_1+x_2+x_3+x_4+x_5 = 30,$ *where,* $x_1 \geq 2, x_2 \geq 3, x_3 \geq 4, x_4 \geq 2, x_5 \geq 0$. **[7M]**

6. (a) There are 30 females and 35 males in the junior class while there are 25 females and 20 males in the senior class. In how many ways can a committee of 10 be chosen so that there are exactly 5 females and 3 juniors on the committee? **[7M]**

   (b) If O is an operation on Z defined by xOy=x+y+1, prove that <Z,O> is an abelian group. **[7M]**

UNIT – IV

7. (a) Solve the recurrence relation $a_n=a_{n-1}+3^n$ where $a_0=1$ by substitution method. **[7M]**

   (b) Solve the recurrence relation using generating functions $a_n - 3a_{n-1} + 2a_{n-2} = 0$ where $a_0 = 1$, $a_1 = 6$. **[7M]**

8. (a) Find the solution of the recurrence relation using characteristic roots

   $a_n - 7a_{n-1} - 12a_{n-2} = 0$ where $a_0 = 2, a_1 = 5.1$

   [7M]

   (b) Find a particular solution to the following in homogeneous recurrence relation $a_n - 5a_{(n-1)} + 6a_{(n-2)}=4^n$ for $n \geq 2$ **[7M]**

UNIT – V

9. (a) Find the Breadth first spanning tree for the following graph shown in Figure 1 considering the order of the vertices as

   i. a, b, c, d, e, f, g, h

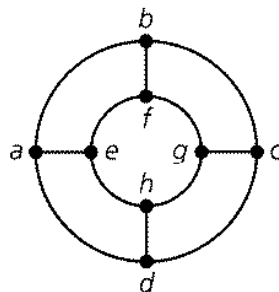   ii. h, g, f, e, d, c, b, a **[7M]**

Figure 1

(b) Show that the following two graphs shown in Figure 2 are not Isomorphic   **[7M]**
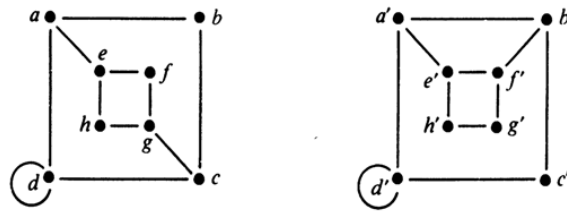

Figure 2

10. (a) Find the Euler circuit in the following graph shown in Figure 3
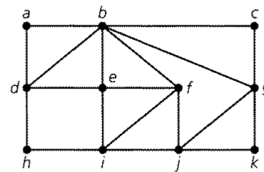
[7M]

Figure 3

(b) Determine a railway network of minimal cost for the cities given in below Figure 4.   **[7M]**
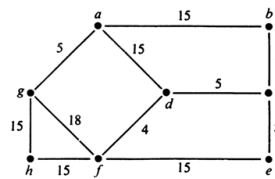

Figure 4

$- \circ \circ \bigcirc \circ \circ -$