Code No: MC1313/R13

### MCA I Semester Supplementary Examinations, January-2018
DISCRETE MATHEMATICAL STRUCTURES AND GRAPH THEORY

**Time: 3 Hours**   **Max. Marks: 60**

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*Answer Any **FIVE** Questions*
All Questions Carry Equal Marks

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1. a   Construct truth table for $(P \wedge Q) \vee (\neg P \wedge Q) \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$ 6M
    b   Obtain the principal conjunctive normal formula for S, which is given by $(\neg P \rightarrow Q) \wedge (Q \rightleftarrows P)$ 6M

2. a   Prove that a relation R on a set A is symmetric if and only if $R = R^{-1}$ 6M
    b   If $f: A \rightarrow B$ and $g: B \rightarrow C$ are bijective functions then $(gof)^{-1} = f^{-1}og^{-1}$ 6M

3. a   There are four bus lines between A and B; and three bus lines between B and C. In how many ways can a man travel (a) by bus from A to C by way of B?. (b) round trip by bus from A to C by way of B?. (c) round trip by bus from A to C by way of B, if he does not want to use a bus line more than once?   6M
    b   Out of 12 employees a group of four trainees is to be sent for software testing and QA training of one month. (a) In how many ways can the four employees be selected ?. (b) what if there are two employees who refuse to go together for training.   6M

4. a   Find solution of the recurrence relation $a_n = -3a_{n-1} - 3a_{n-2} - a_{n-3}$ with initial conditions $a_0 = 1$, $a_1 = -2$, $a_2 = -1$ 6M
    b   Solve the recurrence relation $a_k = 3a_{k-1}$ for k=1,2, 3,… and initial condition $a_0 = 2$ using generating function.   6M

5. a   Define (i) Graph (ii) Directed Graph   (iii) Simple Graph (iv) Multi Graph (v) Finite Graph (vi) Null Graph and give one example to each   6M
    b   Show that the graphs are Isomorphic   6M
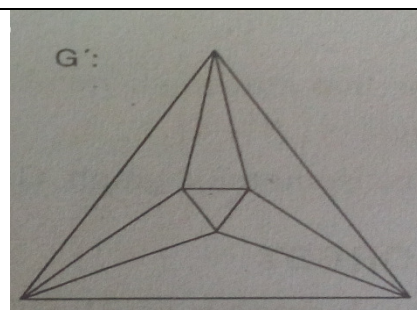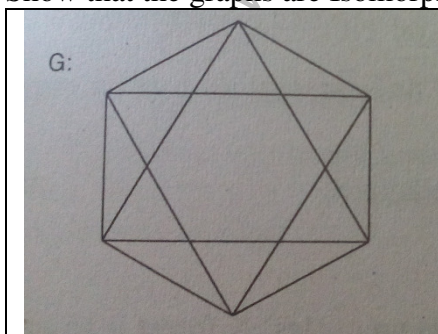
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6. a   Show that $(P \lor Q) \land (\neg P \land (\neg P \land Q)) \Leftrightarrow (\neg P \land Q)$ 6M
    b   Let A={a, b, c, d} be a set and $\wp(A)$ be a power set and $\subseteq$ is an inclusion ordering. Then draw Husse diagram of $(\wp(A), \subseteq)$.   6M

7. a   Of 32 people who save paper or bottles (or both) for recycling, 30 save paper and 14 save bottles. Find the number m of people who (a) save both (b) save only paper and (c) save only bottles.   6M
    b   Find first five terms of the sequence defined by the recurrence relation $a_n = a_{n-1} + 3a_{n-2}$ with initial conditions $a_0 = 1$, $a_1 = 2$ 6M

8. a   Show that the following graph is not Hamiltonian   6M
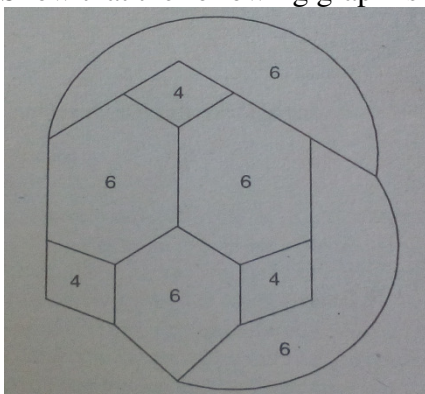
    b   Show that a simple graph is strongly connected if and only if there is a cycle in G which is includes each node at least once and no isolated node   6M

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