M C A (INTEGRATED)
(SEM II) THEORY EXAMINATION 2017-18
DISCRETE MATHEMATICS FOR MCA

Time: 3 Hours   *Total Marks: 70*

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   2 x 7 = 14

   a.   Define Empty Set. If $\emptyset$ is an empty set, Then find Power set :
        $P(\emptyset) \ and \ P\left(P\left(\emptyset\right)\right)$
   b.   Give an example of a relation that is both symmetric and antisymmetric.
   c.   Solve the recurrence relation: $a_n - 5\,a_{n-1} + 6a_{n-2} = 0$.
   d.   Define the Properties of Group.
   e.   Define the Posets with example.
   f.   Define the Linear Ordered Set.
   g.   Define with example: Converse, Inverse and Contrapositive of a proposition.

SECTION B

2.   **Attempt any *three* of the following:**   7 x 3 = 21

   a.   If A = {1,2,3,4} and R = {(1,2)(2,3)(3,4)} be a relation on Set A. Then find
        Symmetric and Reflexive Closure of R.

   b.   Prove the reversal law of inverse in groups (The inverse of the product of two
        element of a group is the product of the inverse taken in reverse order).
        i.e $(ab)^{-1} = b^{-1}.a^{-1}$, $\forall$ a,b $\in$ G.

   c.   Define the term Tautology. Show that $(p \rightarrow (q \wedge r)) \rightarrow (\sim r \rightarrow \sim p)$ is a
        tautology.

   d.   Prove by mathematical induction: $n^4 - 4n^2$ is divisible by 3 for all n≥2.

   e.   If set A = {1,2,3,4,6,8,9,12,18,24} and R be the relation in set A which is
        defined by " a divides b " then show that R is a Poset in set A and also
        draw the Hasse diagram.

SECTION C

3.   **Attempt any *one* part of the following:**   7 x 1 = 7

   (a) Define the Composite relation And Let set A = {1,2,3} , B = {p,q,r}, C =
        {x,y,z} and the relations R = { (1,p), (1,r), (2,q), (3,q)} and S = {(p,y), (q,x),
        (r,z)} then compute RoS.

(b)   Define the function and Relation. Explain the difference between function and Relation with example.

4.   **Attempt any _one_ part of the following:**   **7 x 1 = 7**

(a)   **Solve the following:** $a_n - 8a_{n-1} + 21a_{n-2} - 18a_{n-3} = 0$

(b)   **Solve the following:** $a_{n+2} - 5a_{n+1} + 6a_n = 2$ with initial condition $a_0 = 1$ _and_ $a_1 = -1$

5.   **Attempt any _one_ part of the following:**   **7 x 1 = 7**

(a)   Define the Even and Odd Permutation of Disjoint Cycle. Express the following Permutation as the product of Disjoint Cycles: g = (1 3 2 5) (1 4 3) (2 5 1).

(b)   Show that the four fourth roots of unity forms an abelian group with respect to multiplication.

6.   **Attempt any _one_ part of the following:**   **7 x 1 = 7**

(a)   Define the functionality complete set of connectives. Express the Biconditional statement p↔ q in terms of {~ , ∧} only.

(b)   State the Idempotent, involution and complement laws of algebra of proposition and prove the Associative law of algebra of proposition.

7.   **Attempt any _one_ part of the following:**   **7 x 1 = 7**

(a)   Define the Isomorphic Lattice. Let A= {1,2,3,6} and Let ≤ the divisibility relation on A and let B= { φ, {a}, {b}, {a,b}} and   let ⊆ ≤be the usual relation "is subset of " of set theory .Then show that (A , ≤) and (B , ⊆)   are isomorphic.

(b)   Let D_m denote the positive divisors   of integers m ordered by divisibility. Draw the Hasse diagrams of :   a) D_{72} , b) D_8