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MCA (INTEGRATED)
(SEM. II) THEORY EXAMINATION 2018-19
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 Domain and Range of a function.

b. Define the Power set. If A= {x, y, z} find P(A) and n{P(A)}.

c. State the De-Morgan's Law of Propositional Logic.

d. Find the order and degree of the following recurrence relation:-

$$a_n - 3\,a_{n-1} + 2a_{n-2} = 0.$$

e. State the Principle of Mathematical Induction.

f. Prove that (I,+) is a semi-group where I be the set of all positives even integers and " +" be the ordinary addition operation.

g. Define the Well-ordered set with example.

SECTION B

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

a. In a survey it is found that 21 people like product A, 26 people like product B and 29 like product C. If 14 people like products A and B; 15 people like products B and C; 12 people like products C and A; and 8 people like all the three products. Find:
 i) How many people are surveyed in all?
 ii) How many like product C only?

b. Prove that the set G= { 1,2,3,4,5,6} is a finite Abelian Group of order 6 under the multiplication modulo 7, as the composition in G.

c. Solve the following recurrence relation: $a_n - 7a_{n-1} + 12a_{n-2} = n.4^n$.

d. Define the Term Tautology and Contradiction. Show that : $(p \rightarrow q) \wedge (r \rightarrow q) \equiv (p \vee r) \rightarrow q$.

e. If A = {1,2,3,5,6,10,15,30} be ordered by the relation "a divides b". Then draw the Hesse diagram including all steps.

SECTION C

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

(a) If A = {a,b,c} and R = {(a,b), (b,c), (c,a)} be a relation on Set A. Then find Symmetric and Reflexive Closure of R.

(b) Define the composition of function. And If $X = \{1,2,3\}$, $Y = \{p,q\}$ and $Z = \{a,b\}$ and the functions f and g are define as :
$f : X \rightarrow Y$ be $f = \{(1,p),(2,p),(3,q)\}$ and
$g : Y \rightarrow Z$ be $g = \{(p,q),(q,b)\}$ then find gof and fog.

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

(a) Define the generating function and find out the generating function of the following series:

i. 1,0,0,1,0,0,1,0,0……

ii. $a_r = (r+1).3^r$

(b) By the Principle of Mathematical Induction show that : $n^3 + 2n$ is divisible by 3 for $n \geq 1$.

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

(a) If G = ({a, b}, *) is a semi group. where a*a=b, then show that

i). a*b=b*a **ii).** b *b =b

(b) Show that the Set of cube roots of unity is an abelian group with respect to multiplication.

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

(a) Let A = {1,2 ,3} and P(A) be its power set .Show that (P(A), ⊆) is a lattice.

(b) 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.

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

(a) State and Prove the Associative law of algebra of proposition.

(b) Define the term Arguments. Prove the validity of the following argument "If I get the job and work hard, then I will get promoted. If I get promoted, then I will be happy. I will not be happy. Therefore, either I will not get the job or I will not work hard''.