IMCA EXAMINATIONS-2020-2021
2nd Year, Semester-III, Paper-3.1
Discrete Mathematical Structures

Full Marks: 70 ***Time: 3 Hours***

(Answer ***ALL*** questions)

The figures in the right hand margin indicate marks.

1. ***Answer the followings:*** **[2x7=14]**

(a) Write the negation of the statement P$\rightarrow Q \rightarrow Q$,

(b) Find the reflexive closure of the relation R={(2,2),(2,3),(1, 3)} over the set {1,2,3}

OR.

(c) Explain symmetric closure , Show that there are 2 $\frac{n(n+1)n(n+1)}{2 \quad\quad 2}$ Possible symmetric relation possible for a set having n elements

(d) (i) Find the total number of reflexive relations define on the set A={1,2,3}.

(ii) A graph G(v,e) having 10 vertices and 5 edges find the total number of edges in G^c(v,e) where G^c(v,e) is the complement of G(v,e).

2. (a) Prove by method of induction

[2x7=14]

$1^2+3^2+\ldots\ldots\ldots+(2n-1)^2 = n/3(2n-1)(2n+1), n \geq 1.$

(b) Express the statement "Every student in this class has studied calculus" using predicate and quantifiers.

OR

(c) Let R be a relation define on a set and {a,b} ∈ R with relation a$\equiv bmod(7) \equiv bmod(7)$then show that R is an equivalent relation then prove that R is an equivalent relation.

(d) Show that premises "A student in this class has not read the book" Everyone in this class passed the first exam"imply the conclusion "Someone who passed the first exam has not read the book.

3. (a) Solve the recurrence relation $F_n=10F_{n-1} -25F_{n-2}$ where $F_0=3$ and $F_1=15$. **[2x7=14]**

(b) Find the solution for the recurrence relation $a_0=-3a_{n-1}-3a_{n-2}-a_{n-3}$ where $a_0=1,a_1=-2$ and $a_2=-1$

OR

(c) Explain non homogenous recurrence relation then solve $a_n=5a_{n-1}-6a_{n-2}+7^n$.

(d) Solve the recurrence relation $a_k=3a_{k-1}$ for k=1,2,3, ...with initial condition $a_0=2$.

4. (a) Explain Depth First Search Algorithm with an example. **[2x7=14]**

(b) State and prove Euler theorem for planner graph

OR

(c) State and prove Handshaking Theorem.

(d) Show that an undirected graph has an even number of vertices of odd degree

5. (a) Design a DFA that will accept the string1110only over [0,1]. **[2x7=14]**

(b) Design a DFA for regular expression ab^* over {a,b}

OR

(c) Write a grammar to generate palindrome over alphabets {0, 1}.

(d) Explain minimization of DFSA with a suitable example