QPC: RD19BTECH021 AR 19 Reg. No

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Third Semester – Regular) Examinations, December – 2020

BBSCS3040 – DISCRETE MATHEMATICAL STRUCTURES

(CSE & CST)

Time: 2hrs Maximum: 50 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions)(1 x 10 =10 Marks)

Q.1. Answer ***ALL*** questions

a. Which of the following sentence is not a proposition?

(i) Ram is a name (ii) Four is even

(iii) 5+6=12 (iv) What a hit!

b. $p \to q$ is logically equivalent to

(i) $\neg p \vee \neg q$ (ii) $\neg p \vee q$

(iii) $p \vee \neg q$ (iv) $\neg p \wedge \neg q$

c. If $f(n)$ is defined recursively by f(0)=1 and for $n \geq 0,\ f(n+1) = f(n) + 2$, then f(1) is equal to

(i) 1 (ii) 2

(iii) 3 (iv) 4

d. The generating function for the sequence $1, a, a^2, a^3, \ldots$ is

(i) $\frac{1}{1-ax}$ (ii) $\frac{1}{(1-ax)^2}$

(iii) $1-ax$ (iv) $(1-ax)^2$

e. If a relation R is reflexive, symmetric and transitive then the relation R is called

(i) a poset (ii) an equivalence relation

(iii) partial order relation (iv) equivalence classes

f. A lattice which is complemented and distributive is called a

(i) Boolean algebra (ii) Complemented lattice

(iii) Bounded lattice (iv) Distributive lattice

g. The dual of $x.(x+y) = x$ for all $x, y \in B$ is

(i) $xy = x$ (ii) $x + xy = x$

(iii) $x + (x + y) = x$ (iv) $x + y = x$

h. Let Q^+ be the set of all positive rational numbers under the operation * defined by $a * b = \frac{ab}{2}; a, b \in Q^+$. The identity element of Q^+ under * is

(i) 0 (ii) 1

(iii) 2 (iv) 3

i. The degree of an isolated vertex is

(i) zero (ii) one

(iii) two (iv) three

j. A tree with 20 vertices has

(i) 17 edges (ii) 18 edges

(iii) 19 edges (iv) 20 edges

PART – B: (Short Answer Questions) **(2 x 10=20 Marks)**

Q.2. Answer ***ALL*** questions

a. Let P(x) denote the statement "x>6". What are the truth values of P(7) and P(5)?

b. Solve the recurrence relation $a_n = 3a_{n-1} + 4a_{n-2}; n \geq 2$.

c. In any Boolean algebra, if $a + b = 1$ and $a.b = 0$. Show that $b = a'$.

d. If the permutations of the elements of $\{1,2,3,4,5\}$ are given by $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 1 & 4 & 5 \end{pmatrix}$, $\beta = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 2 & 3 & 5 & 4 \end{pmatrix}$ and $\gamma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 5 & 4 & 3 & 1 & 2 \end{pmatrix}$ then find $\alpha\beta\gamma$.

e. What is the value of the prefix expression $+-3\uparrow 284$?

PART – C: (Long Answer Questions) **(6 x 5=30 Marks)**

Answer ***ANY FIVE*** questions Marks

3. Express the following statements using quantifier: (6)

   "One student in this class know how to write programs in JAVA"

   "Everyone who knows how to write programs in JAVA can get a high paying job"

   imply the conclusion "Someone in this class can get a high paying job".

4. Use mathematical induction to prove that $\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \ldots + \frac{1}{n(n+1)} = \frac{n}{n+1}$ where n is a positive integer. (6)

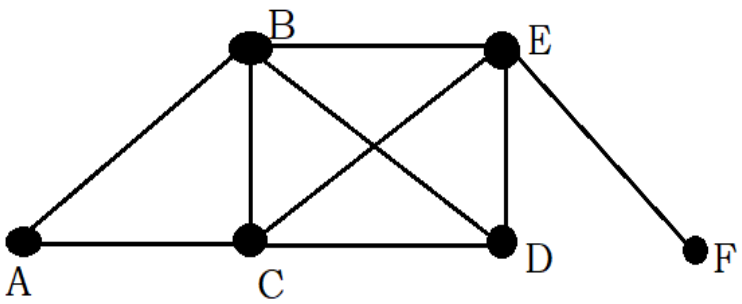
5. Use the method of generating function to solve the recurrence relation $a_n = 3a_{n-1} + 1, n \geq 1$ given that $a_0 = 1$. (6)

6. Using Warshall's algorithm find the transitive closure of the relation $R = \{(1,1),(1,3),(1,5),(2,3),(2,4),(3,3),(3,5),(4,2),(4,4),(5,4)\}$ defined on a set $A = \{1,2,3,4,5\}$. (6)

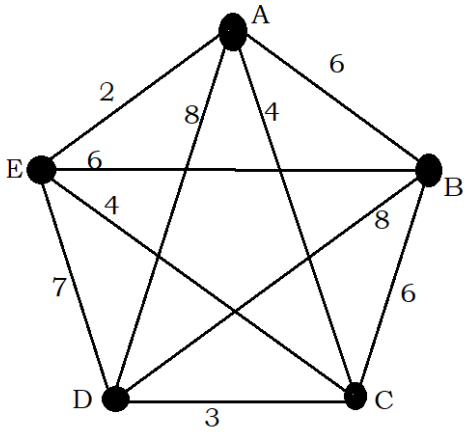
7. Prove that $D_{42} \equiv \{S_{42,} D\}$ is a complemented lattice by finding the complements of all the elements where S_{42} is the set of all divisors of the positive integer 42 and D is the relation of "division", aDb if and only if a divides b. (6)

8. State and prove Lagrange's theorem. (6)

9. Verify handshaking theorem for the following undirected graph. (6)



10. Find the minimum spanning tree for the following weighted graph using Kruskal's algorithm. (6)



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