MID –I UNIT WISE IMPORTANT QUESTIONS

(Exam Date is on 08-02-2022 AN)

Unit-1

1. a) Prove $[(A \rightarrow B) \wedge A] \rightarrow B$ is a tautology

   b) Prove $(A \vee B) \wedge [(\neg A) \wedge (\neg B)]$ is a contradiction

2. Obtain PCNF and PDNF of the formula $(\neg P \vee \neg Q) \rightarrow (p \Leftrightarrow \neg q)$

3. Prove that $[(P \vee Q)) \wedge (P \rightarrow R) \wedge (Q \rightarrow R)] \rightarrow R$ is a tautology

4. Obtain PCNF and PDNF of the formula $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$.

5. S is a valid conclusion from the premises $p \rightarrow q$, $p \rightarrow r$, $\neg (q \wedge r)$ and $(s \vee p)$.

6. Prove the validity of the following argument " If I get the job and work hard, than I will get promoted. If I get promoted, then I will be happy. I will not feel be happy. Therefore either I will not get the job or I will not work hard.

7. Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \wedge Q$, $Q \rightarrow R$, $P \rightarrow M$ and $\neg M$.

8. Write each of the following in symbolic form

(a) Every person is precious. (b) All flowers are beautiful (c) Some students of this school can speak English and know Hindi d) Some men are not giants (e) Not every graph is planar.

9)Let k(x): x is a student M(x): x is a clever N(x): x is successful. Express the following using quantifiers

a) There exists a student **b)** Some students are clever **c)** Some students are not successful

10. Write the symbolic form and negate the following quantifier for the statement
P(x) =" x is a professional athlete", Q(x)= " x plays soccer". Domain is all people.
1) If x is a professional athlete, then 'x' plays soccer.
2) Some professional athlete plays soccer.
3) Every person is either a professional athlete or plays soccer.

Unit-2

1a) Show that the relation R in the set R of real numbers, defined as R = {(a, b): a ≤ b 2} is neither reflexive nor symmetric nor transitive.

b) Check whether the relation R defined in the set {1, 2, 3, 4, 5, 6} as R = {(a, b): b = a + 1} is reflexive, symmetric or transitive.

2a) Show that the relation R in R defined as R = {(a, b): a ≤ b}, is reflexive and transitive but not symmetric.

b) Check whether the relation R in R defined as R = {(a, b): a ≤ b3} is reflexive, symmetric or transitive.

3a. Let f and g be a functions from the positive real numbers to real numbers f(x)=2x and g(x) $=x^2$ then find fog(x) and gof(x).

b) Explain with reason whether the following function is bijective or not.If bijective find its inverse. f(x)=(2x+3)

4a) prove that AU (B ∩ C) = (A∪B) ∩ (A∪C)   b) $(A\cap B)^! = A^! \cup B^!$

5a. Let X= {2, 3, 6, 12, 24, 36} and the relation is ⪯ be such that x⪯y. If x divides y.Draw the diagram of (x⪯y)

b. Obtain the hasse diagram for the partial ordering {(A,B) | A⊆ B} on the power set P(S) where S={a, b, c}

6) Find whether the following is a Distributive Lattice or not for the POSET (60, ⪯).

7) Determine all the sub-lattices of D_{30} that contain at least four elements, D_{30}= {1, 2,3,5,6, 10, 15, 30}.Find GLB and LUB by considering any pair of elements.

8) Construct the lattice for the POSET (30, ⪯).
a) Define maximal elements and find the maximal element for the above Lattice
b) Define minimal elements and find the maximal element for the above Lattice
c) Find LUB and GLB for the lattice for {3,5} pair.

Unit-3 (Part-A)

Algebraic Structures

1. Prove that a group (G,*) is an abelian group iff $(a*b)^2=a^2*b^2$ for all a, b ∈ G.

2a). Show that the set of all roots of the equation $x^4=1$ forms a group under multiplication.

b) Show that the set {1, 2, 3, 4, 5} is not a group under addition and multiplication modulo 6.

3a). Let G={(a,b) | a,b ∈ R, a ≠ 0} Define a binary relation * on G by (a,b)*(c, d) =(ac, bc+d)

b) Prove that the set {0, 1, 2, 3 , 4} is a finite abelian group under addition modulo 5 s composition.

4. Explain the properties of an Abelian Group with an example?

MID –II UNIT WISE IMPORTANT QUESTIONS

(Exam Date is on 01-02-2022 AN)

Unit-3 (Part-B)

Binomial Coefficients

4a) Find the coefficient of x^8 in the expansion of $(x^2+ 1/x)^{10}$

b) Expand $(x+y+z)^4$ using binomial theorem.

5a) Find the coefficient of midterm in the expansion of $(x+y)^{12}$

b) Find the coefficient of 3rd elemement from the end for the equation $(x-y)^{12}$

6a) Find the coefficient of x^{11} in the expansion of $(x^3-2/x^2)^{12}$.

b) Find the $(r+1)^{th}$ term in the expansion of $(x^2+1/x)^n$ where 'n' is the natural number. Verify your answer for the first term of the expansion.

Principal of Inclusion and Exclusion

1a). How many positive integers not exceeding 1000 are divisible by 7 or 11?

b) A total of 1232 students have taken a course in Spanish, 879 have taken a course in French, and 114 have taken a course in Russian. Further, 103 have taken courses in both Spanish and French, 23 have taken courses in both Spanish and Russian, and 14 have taken courses in both French and Russian. If 2092 students have taken atleast one of Spanish, French and Russian, how many students have taken a course in all three languages?

.2a) Find the number of positive integers not exceeding 100 that are divisible by 5 or 7.

b) Suppose that there are 9 faculty members in the mathematics department and 11 in the computer science department. How many ways are there to select a committee to develop a discrete mathematics course at a school if the committee is to consist of three faculty members form the mathematics department and four from the computer science department?

3a). How many integer solutions are there for the equations $x_1+x_2+x_3+x_4=25$ where $0\leq xi\leq 10$, for all $1\leq i\leq 4$.

3b) Find the number of integers between 1 and 250 both inclusive that are divisible by any of the integers 2,3,5,7.

4Determine in how many ways can the letters in the word ARRANGEMENT be arranged so that

i) there are exactly two pairs f consecutive identical letters

ii) Atleast two pairs of consecutive identical letters

Unit-IV

1) a) Find the generating function for the sequence 1,3,5,7,9.....?

b) Find the generating function for the sequence 1, 1, 1, 1, 1, 1...?

2 a) Find the generating function of numeric function $r.5^r$?

b) Find the generating function for the numeric function 2^r+3^r?

Question(s) from Homogeneous Linear recurrence Relation (Roots are similar, dissimilar and Imaginary)

3) a) Find the generating function G(n) for $F_n=10F_{n-1}-25\,F_{n-2}$ where F0=1 and F1=4.

b) Find the generating function G(n) for $F_n=5F_{n-1}+6\,F_{n-2}$ where F0=1 and F1=4.

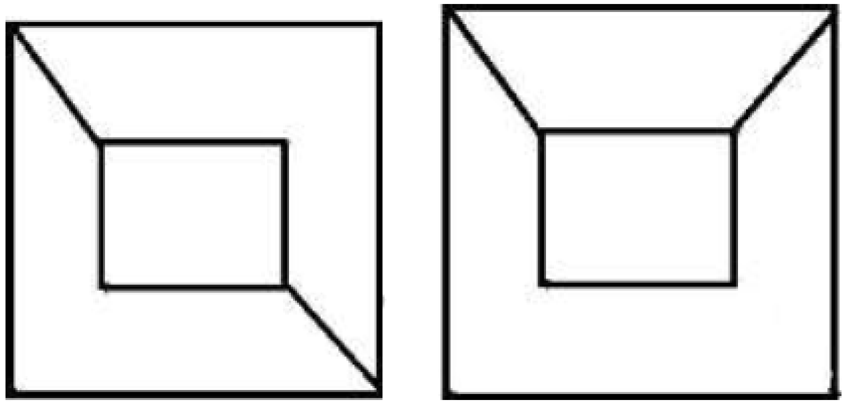
c) Find the generating function G(n) for $F_n=2F_{n-1}-\,2\,F_{n-2}$ where F0=1 and F1=3.

Question(s) from Non-Homogeneous Linear recurrence Relation

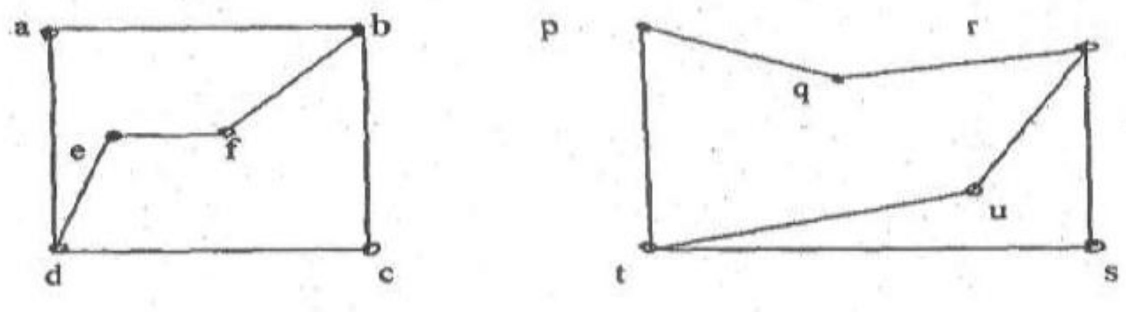
4) Find the generating function G(n) for $F_n=3F_{n-1}-+10F_{n-2}+7.5n$ where F0=4 and F1=3.

Unit-5

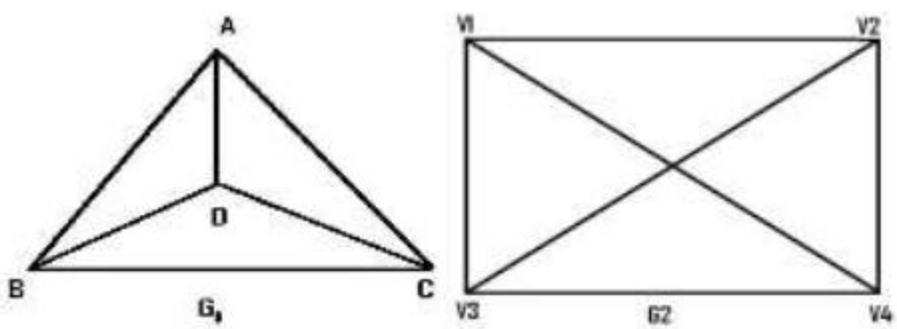
1. Check the given two graphs G and G’ are Isomorphic or not.



2. Check the given two graphs G and G’ are Isomorphic or not.

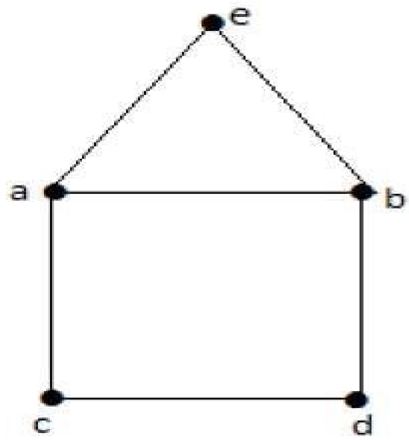


3. Check the given two graphs G and G’ are Isomorphic or not.



4Find whether Euler path / Euler circuit and also Hamilton cycle/Hamilton path can be constructed for the following graphs or not

a)



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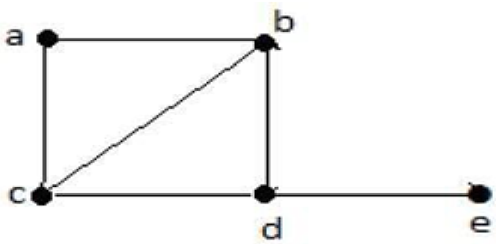
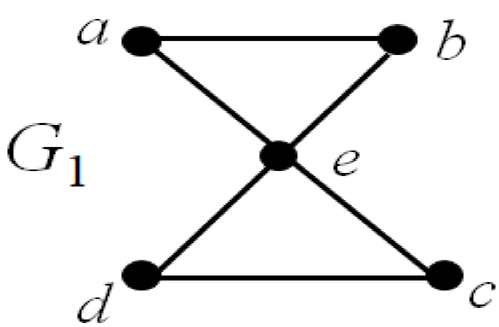
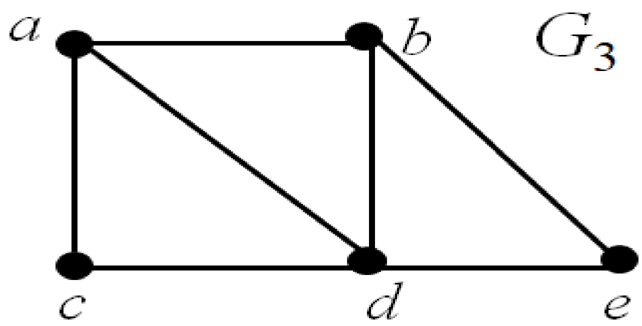


c)

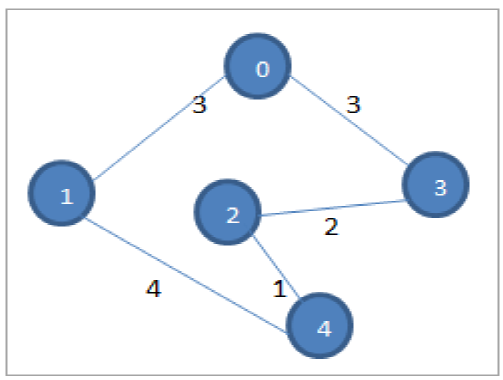


d)

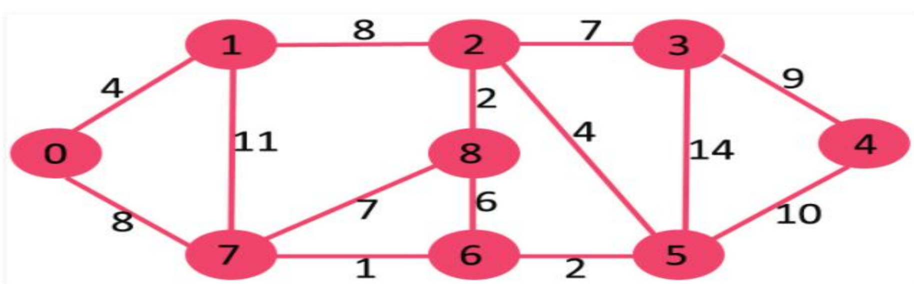


5) Find the minimal spanning tree for the following using Kruskals algorithm and Prims algorithm

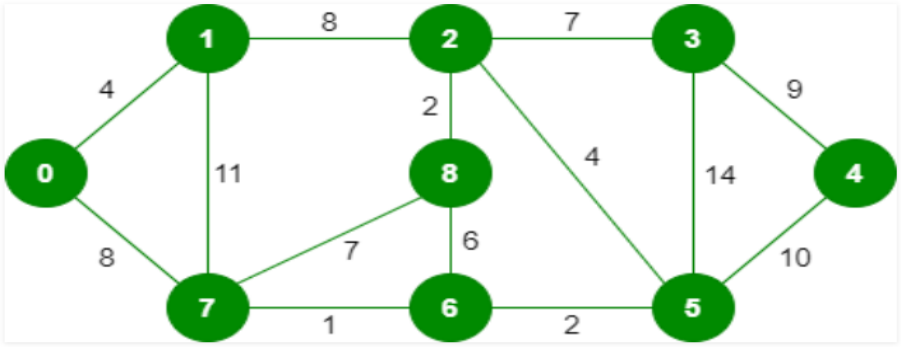
1) Refer (https://www.softwaretestinghelp.com/minimum-spanning-tree-tutorial/)



2) (Refer https://www.geeksforgeeks.org/prims-minimum-spanning-tree-mst-greedy-algo-5/)



3) Refer (https://www.geeksforgeeks.org/kruskals-minimum-spanning-tree-algorithm-greedy-algo-2/)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