Register Number:……………..

KUMARAGURU
college of technology
character is life

B.TECH DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2018)

Fifth Semester

FASHION TECHNOLOGY

U17MAT5102: Discrete Mathematics

COURSE OUTCOMES

CO1:   Understand the concepts of set theory and apply them to situations involving inclusion and   exclusion

CO2:   Acquire the knowledge of relations, and analyse equivalence relations and their properties.

CO3:   Understand and analyse the properties of different kinds of functions.

CO4:   Apply mathematical induction to prove mathematical facts, analyse and use the concept of permutation and combination and solve recurrence relations.

CO5:   Evaluate the validity of logical arguments and construct simple mathematical proofs.

CO6:   Determine whether given graphs are isomorphic and apply Dijkstra's algorithm to find the shortest path.

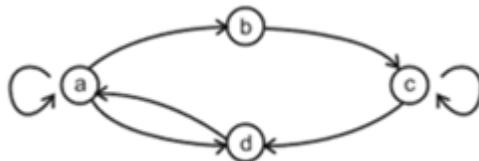**Time: Three Hours**   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1.   If A = {1,2}, B = {2,3}, C = {4,5}, D ={5,6} then find (A×B) ∪ (C×D)   CO1   [K2]

2.   Determine the number of positive integers between 1 and 250, both inclusive, that are divisible by 4, 5 and 6.   CO1   [K2]

3.   Write down the relation of the following digraph   CO2   [K2]

4.   Verify which of the following are functions? Justify.   CO3   [K2]
   i)   ii)
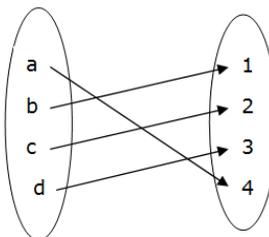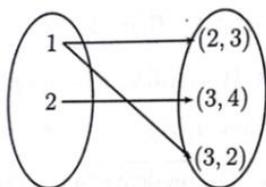
5.   Write down the Fibonacci sequence and its recurrence relation .   CO4   [K1]

6. Let $s(n) = 1.2 + 2.3 + 3.4 + \cdots = \frac{n(n+1)(n+2))}{3}$ be a given sequence. Determine

S(k+1) of the sequence. — CO4 [K₁]

7. Discuss the truth table for $p \wedge q$ and $p \vee q$. — CO5 [K₂]

8. Write the symbolic representation of the following argument using predicate calculus.Let — CO5 [K₂]

P(x): x is a parrot, G(x) : x is in green color, then the symbolic form of "All parrots are green "

9. Define a regular graph with an example. — CO6 [K₂]

10. Write the adjacency matrix of the graph. — CO6 [K₂]
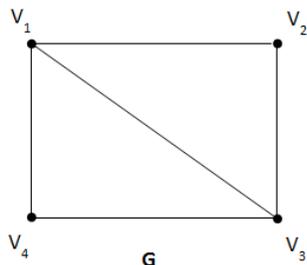
Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. a) In a survey of 100 students, it was found that 40 studied — CO1 [K₃]
    Mathematics, 64studied physics, 35 studied Chemistry. 1 studied all
    the three subjects. 25studied mathematics and physics, 3 studied
    mathematics and chemistry and 20studied physics and chemistry.
    Find the number of students
    i) who studied only one subject
    ii)who studied none of these subjects.
    iii) Who studied only two subjects.

    b) If R is the relation on the set of integers such that $(a, b) \in R$ iff — CO2 [K₃]
    3a+4b=7n for some integer n, prove that R is an equivalence
    relation.

12. a) If $f : R \rightarrow R$ and $g : R \rightarrow R$ are function defined by — CO3 [K₃]

    f(x)=x² + 3x + 1 and g(x)=2x−3, find f ∘g, g ∘ f, f ∘ f, g ∘ g.

    b) Check whether the function $f : R-\{3\} \rightarrow R-\{1\}$ given by — CO3 [K₄]

    $f(x) = \dfrac{x-2}{x-3}$ is bijective. If so find the inverse of the function.

13. a)　Prove by mathematical induction that $n^3 + 2n$ divisible by 3.　　　CO4　[K₃]

b)　How many bit strings of length 10 contain exactly　　　CO4　[K₃]
　　i) exactly 4 four 1's　　ii)atmost four 1's
　　iii) atleast four 1's　　iv)an equal number of 0's and 1's?

14. a)　Obtain the principal disjunctive normal form(PDNF) and conjunctive　　　CO5　[K₃]
normal forms (PCNF):　$(p \rightarrow (q \wedge r)) \wedge (\neg p \rightarrow (\neg q \wedge \neg r))$.

b)　Show that the following argument is valid. "Every microcomputer has　　　CO5　[K₄]
a serial interface port. Some microcomputers have a parallel port.
Therefore, some microcomputers have both serial and parallel port ".

15. a)　Check the isomorphism between the following graphs　　　CO6　[K₄]
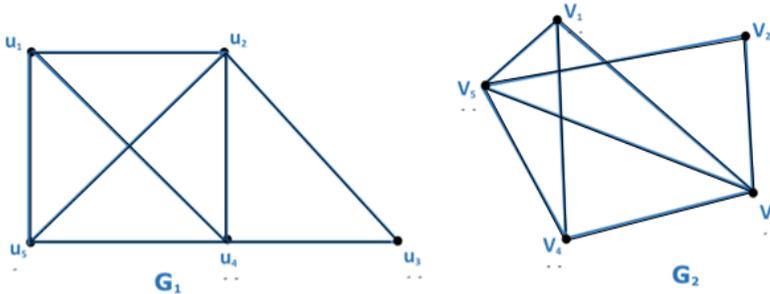
b)　Find the shortest path from the vertex A to F using Dijkstra's Algorithm.　　　CO6　[K₃]

16. a)   CO2   [K$_3$]
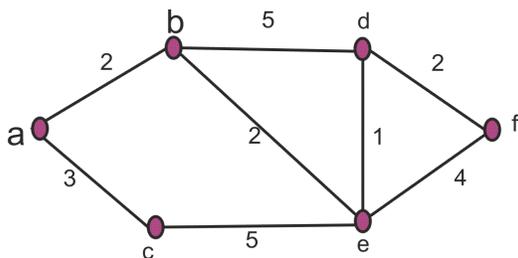
Given $M_R = \begin{pmatrix} 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 \end{pmatrix}$ and $M_S = \begin{pmatrix} 1 & 1 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$ find

$$M_{R \cup S}, \; M_{R \cap S}, \; M_{R \circ S}, \; M_{S \circ R}$$

b)   Let   A   =   {1,2,3,4,5,6}   and   the   permutations   be   CO3   [K$_3$]

$$p_1 = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 4 & 1 & 2 & 6 & 5 \end{bmatrix}, \; p_2 = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 3 & 1 & 5 & 4 & 6 \end{bmatrix}, \; p_3 = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 6 & 3 & 2 & 5 & 4 & 1 \end{bmatrix}$$

find i) P_1^{-1}, P_2^{-1} ii) $P_1^{-1} \circ P_2^{-1}$ iii) $(P_2 \circ P_1) \circ P_3$

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