

(3 Hours)

Total Marks: - 80

N.B.

1. Question no.1 is compulsory.
2. Attempt any three questions from the remaining five questions.
3. Figures to the right indicate full marks

- 1 (a) Let Set  $A = \{ 2,3,4,5,6,30,60 \}$  and the partial order relation  $R$  is the divides relation on set  $A$ . i.e.  $a|b \iff aRb$  iff (a divides b) (10)
  - Draw the digraph of  $R$
  - Draw the Hasse diagram for the poset  $(A,R)$
  - Find the minimal elements, maximal elements, least & greatest element, if it exists
- (b) Prove that  $[p \rightarrow (q \rightarrow r)] \rightarrow [(p \rightarrow q) \rightarrow (p \rightarrow r)]$  is a tautology (5)
- (c) Explain Time Changing Environment in Decision Making (5)

- 2 (a) There are three alternatives  $A_1, A_2, A_3$  and there are four criteria  $C_1, C_2, C_3, C_4$ . (10)  
The comparison matrix for pair wise criteria is given below

	$C_1$	$C_2$	$C_3$	$C_4$
$A_1$	15	12	20	10
$A_2$	11	19	14	35
$A_3$	10	20	13	11

The weights for criteria  $C_1, C_2, C_3, C_4$  are 0.2, 0.15, 0.4, 0.25, respectively. Find the best alternative using Weighted Product Model (WPM).

- 2 (b) Use Mathematical Induction to prove the property  $P(n)$  (10)
  - $P(n): n < 2^n \forall n \in \mathbb{N}$
  - $P(n): 3n + 2$  is an odd number then  $n$  is odd, where  $n$  is a natural number

- 3 (a) Find the weights for each criteria using Entropy/Shannon Theory (10)

	$C_1$	$C_2$	$C_3$	$C_4$
$A_1$	25	20	15	30
$A_2$	10	30	20	30
$A_3$	30	10	30	10

- (b) A pair of dice are rolled. If a sum of 7 is obtained then the person wins, else the person loses. If costs Rs 1 to play the game. If the person wins he gets his 1 rupee back and gets an additional 5 rupees. Otherwise, the person loses 1 rupee. If the bet is placed 100 times, how much is the person expected to lose or win? (10)

4 (a) Obtain a recurrence relation for Tower of Hanoi problem. There are  $n$  rings resting on peg A. The rings are to be transferred to peg B. No ring of a larger size is allowed to be kept on a ring of smaller size. How many moves are required? Peg C is available for temporary storage. (10)

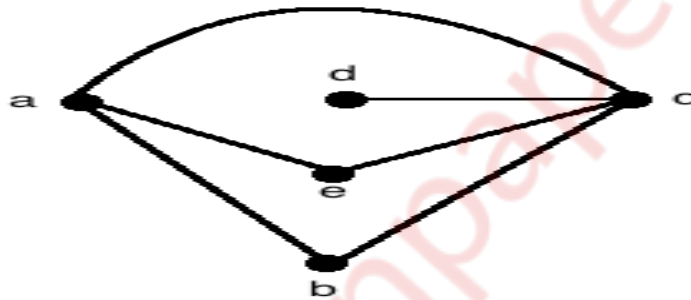
4 (b) Are the following statements valid? (10)

- If I try hard and I have talent then I will become a musician.
- If I become a musician then I will be happy.

Therefore, I will not be happy then either I did not try hard or I do not have talent.

5 (a) Find the homogenous solution of the recurrence relation  $a_n = 6a_{n-1} - 11a_{n-2} + 6a_{n-3}$  with boundary conditions  $a_0 = 2, a_1 = 5, a_2 = 15$  (10)

(b) Find the adjacency list, adjacency matrix, Euler path and Euler circuit for the following graph (10)



6 (a) Find the particular solution of the following recurrence relation:  $a_n + 5a_{n-1} + 6a_{n-2} = 42 \times 4^n$  (10)

(b) Determine if the relation  $R$  on set  $A$  is reflective, irreflexive, symmetric, asymmetric, antisymmetric and transitive.  $A =$  set of real numbers and  $aRb$  iff  $|a - b| = 2$  (10)

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