

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

MCA I Year I Semester (R18) Supplementary End Semester Examinations – February 2022

(Regulations: R18)

DISCRETE MATHEMATICS

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.

In Q.no 1 to 5 answer either Part-A or B only

Q.1(A) (i) Check whether the conditional statements is a tautology ? 6M

$$[(p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)] \rightarrow r$$

(ii) Let $Q(x, y)$ denote the statement " $x = y + 3$ ". What is the truth values of the propositions $Q(1, 2)$ and $Q(3, 0)$? 3M

(iii) Show that the premises "A student in this class has not read the book," and "Everyone in this class passed the first exam" imply the conclusion "Someone who passed the first exam has not read the book." 3M

OR

Q.1(B) (i) Consider these statements ,of which the first three are premises and the fourth is a valid conclusion. 6M

"All hummingbirds are richly colored"

"No large birds live on honey "

"Birds that do not live on honey are dull in color"

"Humming birds are small"

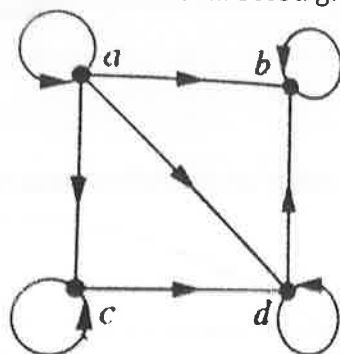
(ii) Prove that if n is an integer and n^2 is odd, then n is odd. 6M

Q.2(A) (i) Let the relation R on a set is represented by the matrix 6M

$$M_R = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

Is R Reflexive, symmetric and /or anti symmetric?

(ii) Determine whether the relation with the directed graph is a partial ordering or not?



6M

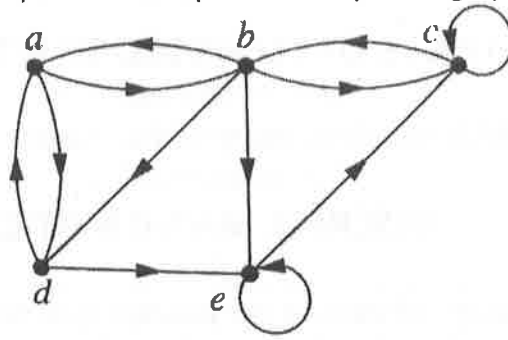
OR

Q.2(B) (i) Which elements of the POSET $(\{2, 4, 5, 10, 12, 20, 25\}, /)$ are maximal, minimal, least upper bound and greatest lower bound. 6M

(ii) Define Lattice and Decide whether the set $I_+ = \{(a, b) / a \text{ divides } b\}$ under division operation is a lattice or not? 6M

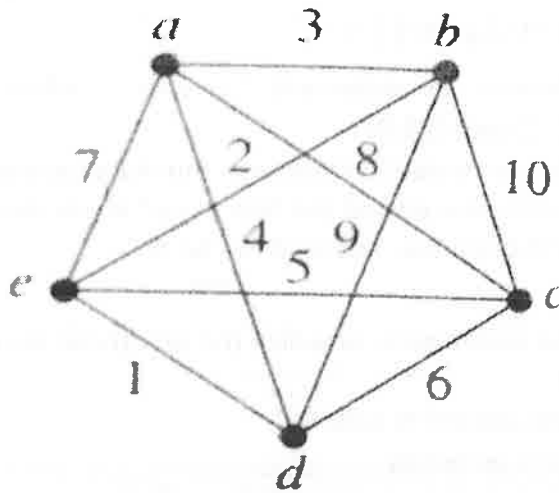
Q.3(A) (i) (a) Draw the adjacency matrix to represent the pseudograph.

3M



7M

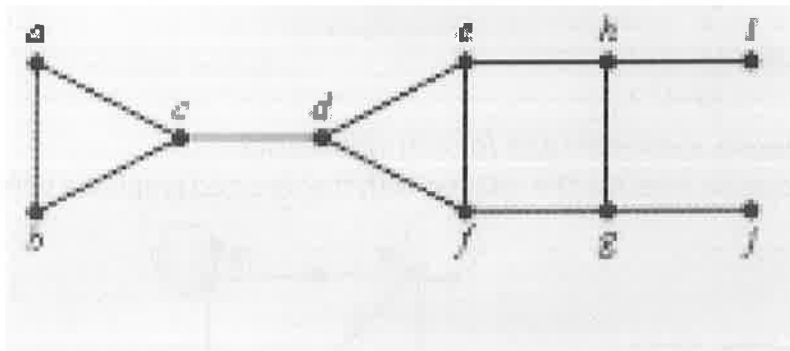
(ii) Solving the travelling Salesman problem for this graph by finding the total minimum weight of all Hamiltonian circuits and determine a circuit with minimum total weight.



OR

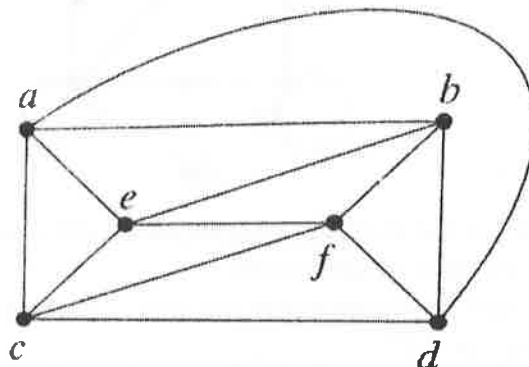
Q.3(B) (i) Use DFS to produce a spanning tree for the graph

6M



4M

(ii) Find the chromatic number of the following graph



- Q.4(A) (i) Is the set of Natural numbers, a semigroup under the operation $x*y=\max\{x,y\}$. Is it monoid? 6M
 (ii) What is the solution of the recurrence relation $a_n = 6a_{n-1} - 9a_{n-2}$, $a_0 = 1, a_1 = 6$. 6M

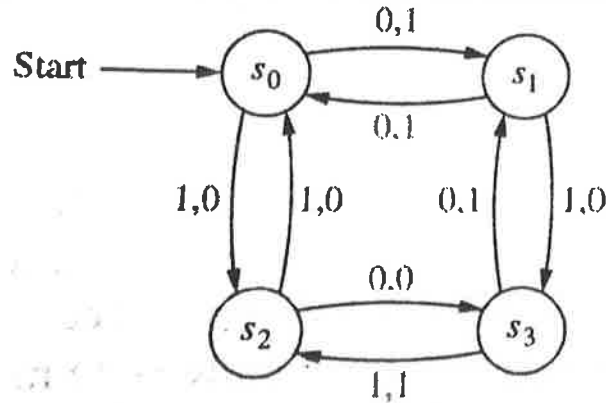
OR

- Q.4(B) (i) Explain Pigeonhole principle with suitable examples. 6M
 (ii) Give an inductive definition of the factorial function $F(n)=n!$. 6M

- Q.5(A) (i) Express $\gcd(252,198)=18$ as a linear combination of 252 and 198. 6M
 (ii) Encrypt the message STOP using the RSA cryptosystem with $p=43$ and $q=59$, so that $n=43*59 = 2537$ and with $e=13$. 6M

OR

- Q.5(B) (i) Give the state table for the finite state machine with the state diagram. 6M



- (ii) Find an inverse of 3 modulo 7. 6M

***** END*****

