MCA- Sem- I (CBS) 27/5/13
Discrete mathematics.

Con. 7561–13. **BS–3621**

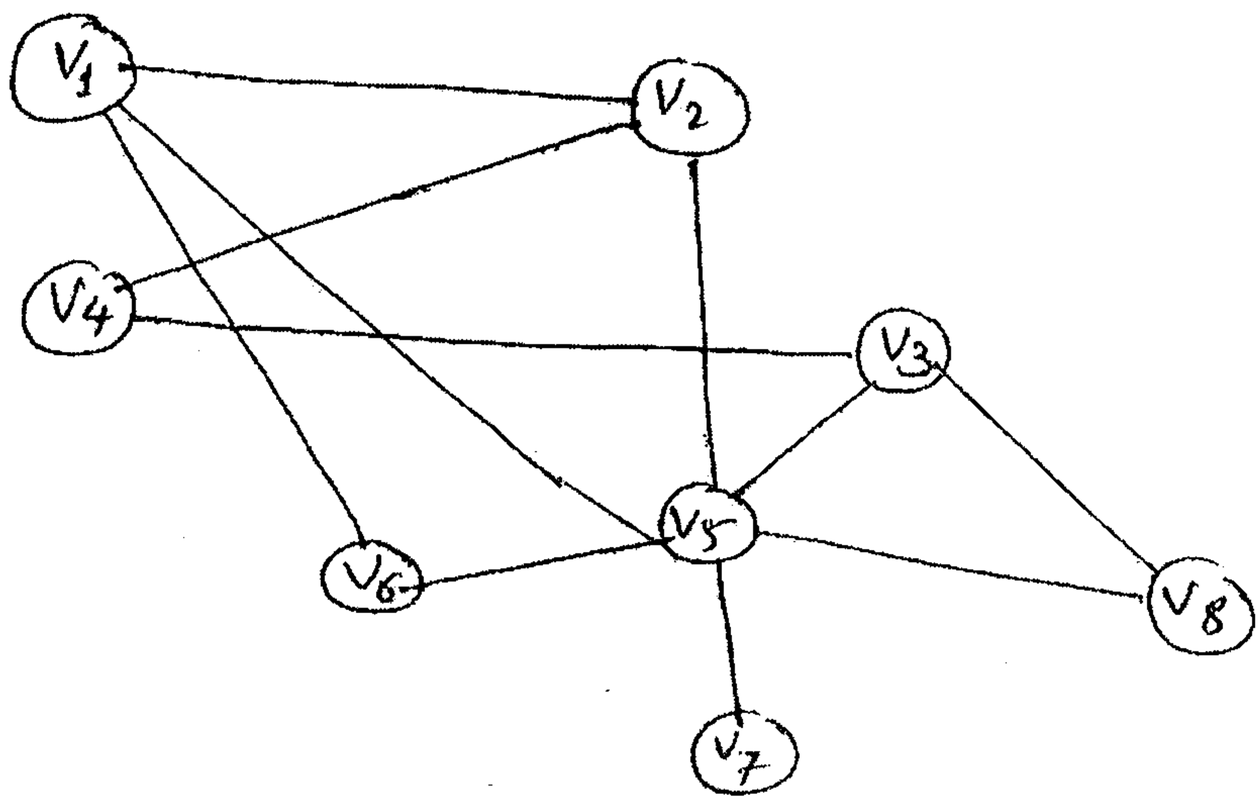
(3 Hours) **[Total Marks : 80**

N.B. (1) Question No.**1** is **compulsory.**
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume any **necessary** data but justify the same.
(4) **Figures** to the **right** indicate **full** marks.

1. (a) Determine whether the relation R on a set A is reflective, irreflective, symmetric, asymmetric, antisymmetric or transitive. **10**
A = set of all positive integers, aRb iff $|a - b| \leq 2$
(b) State the 'Tower of Hanoi" problem and obtain the corresponding recurrence relation indicating the suitable initial condition(s). Solve the recurrence relation obtained. **10**

2. (a) Determine whether the following set (S) together with the binary operation is semigroup, a monoid or neither. If it is a monoid, specify the identity. If it is a semigroup or monoid, determine whether it is commutative. **8**
Set S = set of real numbers, $a * b = a + b + 2$
(b) Obtain the conjunctive normal form of : **7**
$\neg(P \vee Q) \leftrightarrow (P \wedge Q)$

3. (a) Give adjacency matrix and adjacency list for the following graph : **8**



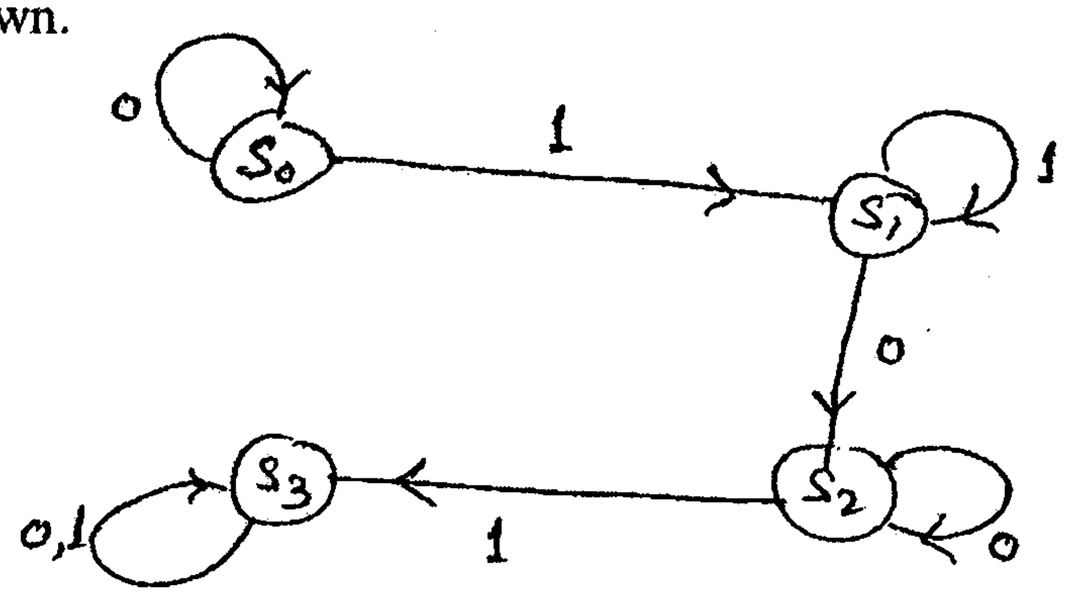
(b) Define minimum distance of an encoding function. Consider the (2,9) encoding function e defined by **7**

e(00) = 000 000 000 e(01) = 011 101 100

e(10) = 101 110 001 e(11) = 110 001 111

Let d be an associated maximum litelihard function. How many errors will (e, d) correct ?

4. (a) Construct the state transition table of the finite, state machine M(S, I, F) whose digraph is shown. **8**



List the value of Fw where w = 10011

(b) Test the validity of the following : **7**

If milk is black then every crow is white. If every crow is white then it has four legs. If every crow has four legs than every buffalo is white and brisk. The milk is black. So every buffalo is white.

5. (a) Let A = {1, 2, 3) and R and S be the relations on A. **8**
Suppose that matrices of R and S are :

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

Give matrices of (i) $R \cup S$ (ii) $R \cap S$ (iii) R^{-1} (iv) $\bar{S}$

(b) Use generating functions to solve the recurrence relation. **7**
$a_k = 5a_{k-1} - 6a_{k-2}$, $k \geq 2$ with the initial conditions $a_0 = 6$, $a_1 = 30$

6. (a) Let S = {x/x is a real number and $x \neq 0$, $x \neq 1$} **8**
Consider the following functions.
$f_i : S \to S$, i = 1, 2, ... 6.

$f_1(x) = x$, $f_2(x) = 1 - x$, $f_3(x) = \frac{1}{x}$

$$f_4(x) = \frac{1}{1-x}, \qquad f_5(x) = 1 - \frac{1}{x}, \qquad f_6(x) = \frac{x}{x-1}$$

Show that G $\{f_1, f_2, f_3, f_4, f_5, f_6\}$ is a group under the operation of composition. Give the multiplication table of G.

(b) Let S = {1, 2, 3, 4) and A = S × S. Define the following relation R on A: 7
(a, b) R (a', b') if and only if ab' = a'b
Show that R is an equivalence relation. Compute A/R.

7. (a) Consider the (2, 5) encoding function defined by **8**
e(00) = 00000, e(01) = 01101, e(10) = 10011, e(11) = 11110
Check if e is a group code. Decode the word 10100 with maximum likelihood technique.

(b) Establish the following result without using truth table. 7

$$\neg(\neg P \wedge Q) \rightarrow (P \vee (P \vee Q)) \equiv (\neg P \vee Q)$$

MCA Sem I

11/5/2013

System Analysis Design

Con. 7980–13.

BS–5101

(3 Hours) [Total Marks : 100

N.B. (1) Question No. 1 is **compulsory.**
(2) Attempt any **four** from question Nos. 2 to 7.
(3) Illustrate answers with sketch wherever **required.**

1. (a) Design an online examination system which provides candidates to select the subjects and give the exam and get the result. Draw CLD, DFD upto two levels, E.R. diagram. Draw input and output screens. **10**
   (b) What is structured walkthrough ? When it is conducted and what role does the user play in this stage ? **10**

2. (a) What is meant by system analysis ? Explain the roles performed by system analyst. **10**
   (b) Explain the different phases of SDLC.

3. (a) Explain the different fact finding techniques. What are the advantages and disadvantages of interview technique ? **10**
   (b) What is feasibility study ? Explain different types of feasibility study. **10**

4. (a) Explain the concept of normalization with the help of an example. **10**
   (b) What is user interface design ? What tools are used to chart user interface design ? **10**

5. (a) Compare and contrast testing for conventional testing and object oriented software. **10**
   (b) What are coupling and cohesion ? Give examples for each.

6. (a) Define implementation. What are the different phases of implementation. **10**
   (b) What is the use of CASE tools ? Explain any five CASE tools with functionality of each. **10**

7. Write short notes on any **four** :– **20**
   (a) Cost benefit analysis
   (b) Decision table
   (c) HIPO chart
   (d) RAD model
   (e) Debugging.