## UNIVERSITY QUESTIONS

**Subject: DSGT**

Q. 1 Find the complete solution of the recurrence relation

Q. 2 Determine the number of positive integers n where 1<=n<=100 and n is not divisible by 2,3 or 5

Q. 3 Show that in any room of people who have been doing some handshaking there will always be at least two people who have shaken hands the same number of times. Also explain Pigeonhole principle and Extended Pigeonhole principle.

Q. 4 Prove that among 100000 people, there are two who are born at exactly the same time(HH:MM:SS).

Q. 5 What is the minimum no. of students required in a discrete structures class to be sure that at least six will receive the same grade, if there are 5 possible grades A,B,C,D and E.

Q. 6 Prove that set G={1,2,3,4,5,6} is a finite abelian group of order 6 with respect to multiplication modulo 7. Also discuss the terms of Groups and Subgroups.

Q. 7 Solve following:

Given the parity check matrix

$$H = \begin{vmatrix} 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 \end{vmatrix}$$

Find the minimum distance of the code generated by H. how many errors it can detect and correct.

Q. 8 Prove that the set G=(0,1,2,3,4,5) is an abelian group of order 6 with respect to addition modulo 6.

Q. 9 Let H={$[0]_6$ ,$[3]_6$} find the left and right cosets in group $Z_6$. Is H a normal subgroup of group of $Z_6$.

Q. 10 Consider the (3,6) encoding function e:$B^3$ -> $B^6$ defined by

| | | |
|---|---|---|
| e(000)=000000 | e(001)=001100 | e(010)= 010011 |
| e(011)=011111 | | |

e(100)=100101          e(101)=101001

e(110)=110110          e(111)=111010

Decode the following words relative to a maximum likelihood decoding function

 i) 000101     ii) 010101

Q. 11 Show whether the following graphs are isomorphic or not. Also define isomorphic graphs and homomorphic graphs.
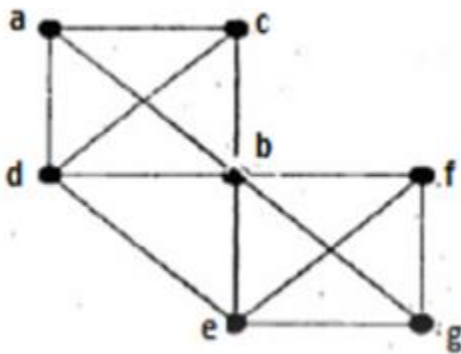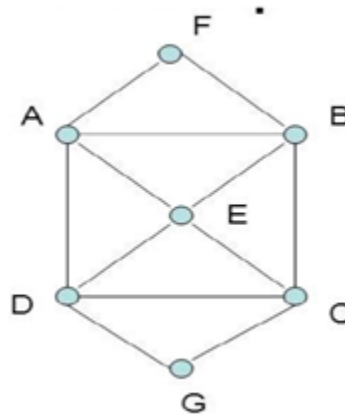
Q. 12



Fig. a                                    Fig. c
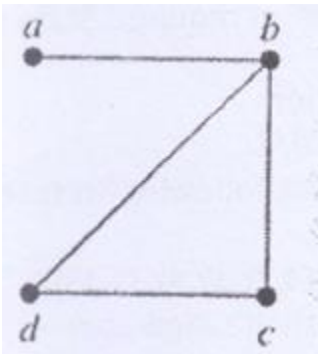
Determine Euler Cycle and path in graph shown in fig a,c.

Fig. b

Determine Hamiltonian Cycle and path in graph shown in fig b.

Q. 14 Let G=$Z_8$, determine all left cosets of H={[0],[4]} in G.

Q. 15 In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there?

Q. 16 A box contains 6 white balls and 5 red balls. In many ways 4 balls can be drawn from the box if i) they are to be of any color ii) all the balls to be of the same color.

Q. 17 how many friends must you have to guarantee that at least five of them will have birthdays in the same month.

Q. 18 In how many ways a committee of three faculty members and 2 students can be formed from 7 faculty members and 8 students.

**Subject: DSA**

1. Create an AVL tree using the following data entered as a sequential set. Show all the steps. 15, 20, 24, 10, 13, 7, 30, 36, 25. Show which rotations are used while constructing AVL tree.

2. How does AVL Tree differ from Binary Search Tree? Show the results of inserting 15,19,22,10,3,37,25,12,13 one at a time into an initially empty AVL tree.

3. Create AVL tree by inserting the given values in sequence

45,8,33,85,61,10,48,76,57,99

4. Create an expression tree for the following expressions

      1 ]     A + B * C/D -E

    2] (3x + 5)(6x - 4)

5. Draw the B-tree of order 3 created by inserting the following data arriving in sequence: 92 24 6 7 11 8 22 4 5 16 19 20 78

6. Create a B tree of order 3 for the following data arriving in sequence:
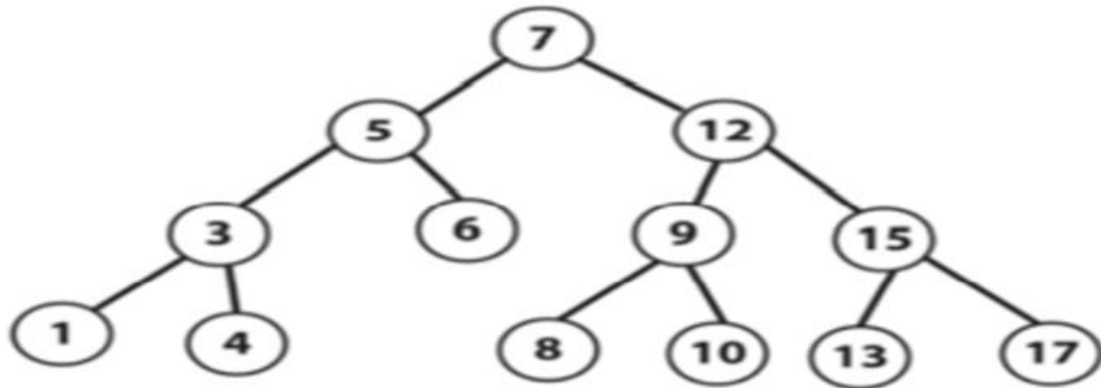
90, 27, 7 , 9, 18, 21, 3, 16 , 11

7. Consider the Binary Search Tree given below and find the result of post-order traversal sequence.
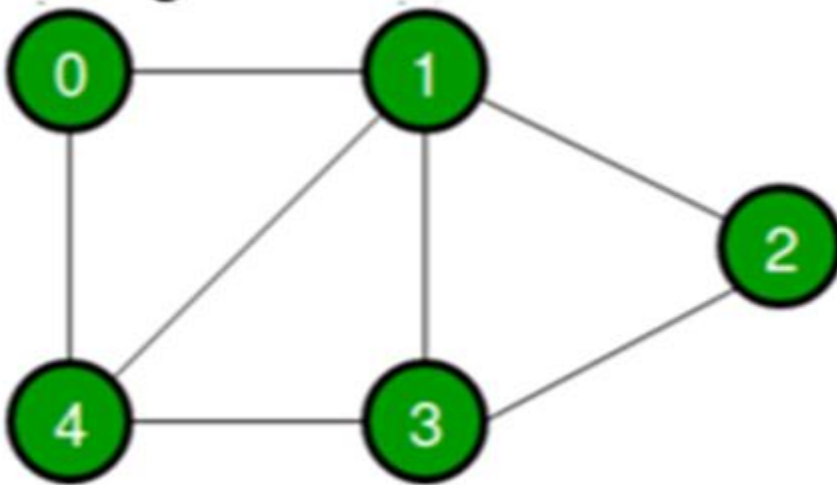
8.    Give the breath-first traversal of the graph for the following graph, starting from vertex 0. Show all the steps.

9.    For the following graph, show all the steps of the Depth First Search traversal starting with vertex 1.
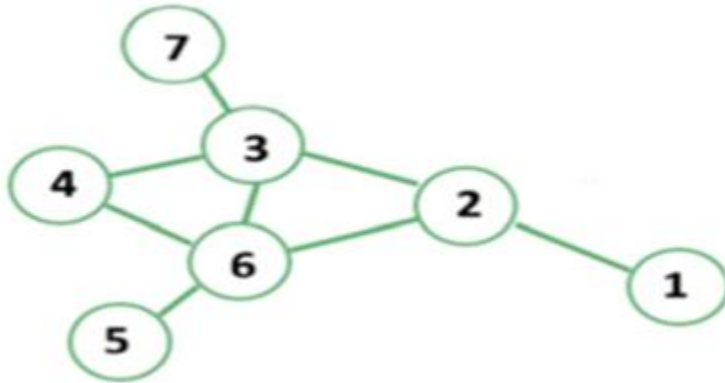


10.  Write the function for BFS traversal of graph ADT. Show with a directed graph the BFS traversal.

11.  Consider the given directed acyclic graph. Sort the nodes by applying topological sort on the graph.
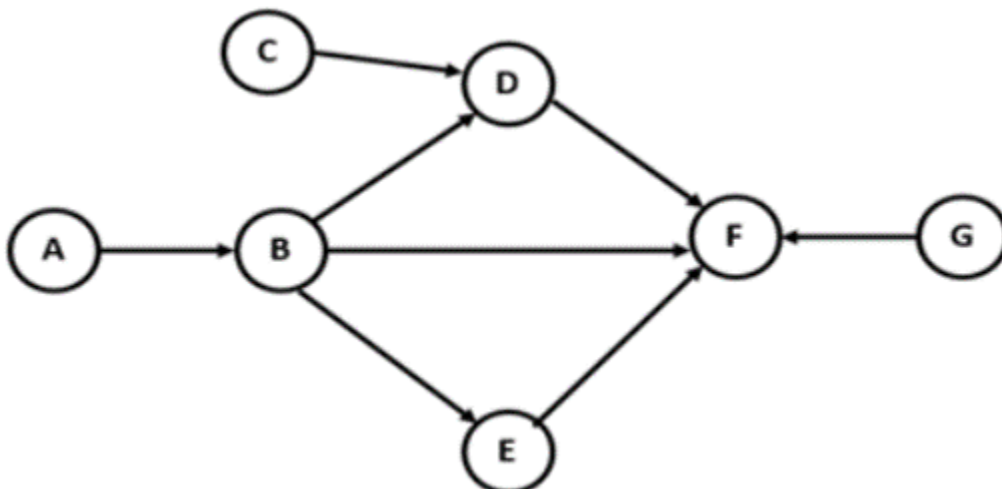
12.  Explain Depth First Search (DFS) traversal with an example. Write the recursive function for DFS.

13.  Consider a hash table of size 11 that uses quadratic probing to resolve collisions. Insert the keys: 12, 19, 23, 30, 34, 45, 59, 61 in sequence in the hash table. Draw the table after inserting in the given order and also find the total number of collisions.

14.  Using linear probing and modulo division method, hash the following elements into a table of size 11

45, 8, 33, 85, 61, 10 , 48, 76, 89

15.  Consider a hash table with size = 10. Using quadratic probing , insert the keys 27, 72, 63, 42, 36, 18, 29, 101 into the table. Take $c1 = 1$ and $c2 = 3$.

16.  What is Hashing? Hash the following data in a table of size 10 using linear probing and quadratic probing. Also find the number of collisions.

63, 82, 94, 77, 53, 87, 23, 55, 10 ,44

17.  Write a short note on collision handling techniques.

18.  Explain linear probing with suitable example.


## Subject: CG


1       What is meant by Parallel and Perspective Projection? Derive a matrix for Oblique Projection.

2       Explain Liang Barsky line clipping algorithm. Apply the algorithm to the line with coordinates (30,60) and (60,25) against the window(xmin,ymin)=(10,10) and (xmax,ymax)=(50,50).

3       Clip the line PQ having coordinates P(4,1) Q(6,4) against the clip window  having vertices A(3,2) B(7,2) D(3,6) C(7,6) using the Liang barsky line clipping algorithm.

4       What is window and viewport? Derive the matrix for viewport transformation

5       Explain what is meant by Bezier curve? State the various properties of Bezier curve

6       What is meant by parallel and perspective projection? Derive matrix for perspective projection

7       Explain Z Buffer algorithm for hidden surface removal.

8       Explain Sutherland Hodgman polygon clipping algorithm with suitable example and comment on its shortcoming

9       Explain Area subdivision algorithm for hidden surface removal

10      What do understand by Control points, Degree of continuity, Local and Global control w.r.t Curve Generation?

11      Explain Cohen Sutherland line clipping algorithm. Apply the algorithm for ABCD be the rectangle window A(20,20) B(90,20) C(90,70) & D(20,70).  Find region codes for the endpoint to clip the P1P2 with P1(10,30) P2(80,90)  and P3P4 with P3(10,10) P4(70,60).

12      Explain Sweep Representation and CSG Method

13      Explain Liang Barsky line clipping algorithm, what are its benefits over Cohen Sutherland algorithm? Clip the line with Co-ordinated (5,10) and (35,30) against the window (xmin,ymin)=(10,10) and (xmax,ymax)=(20,20)

14   Write a short note on Fractals. Also explain how the fractal dimension is calculated.

15   Explain the 12 Animation principles

16   Write a short note on Back Surface Detection method.

**SUB: DLCA**

1.  Write a short note on Address Sequencing technique in microcontroller unit.

2. Compare Hardwired and Microprogrammed control unit
3. Explain a micro-program for FETCH routine of instruction cycle
4. Explain Delay element method for designing of Hardwired Control Unit.
5. Classify and explain different types of primary memory.
6. Determine characteristics of memory.
7. Consider a fully associative mapped cache of size 16 KB with block size 256 bytes. The size of the main memory is 128 KB. Determine Number of bits in tag and tag directory size.
8. Consider a direct mapped cache of size 512 KB with block size 1 KB. There are 7 bits in the tag. Find-

    a. Size of main memory

    b. Tag directory size

9. Illustrate Flynn's classification.
10. Show the performance measures of pipelining.
11. Illustrate and derive the expression for Amdahl's law.
12. A program having 10 instructions is executed on non-pipeline and pipeline processors. All instructions are of same length and having 4 pipeline stages and time required to each stage is 1ns.
    a. Calculate time required to execute the program on non-pipeline and pipeline processor.
    b. Calculate speed-up.
13. Explain microinstruction format.
14. A block set associative cache consists of 64 blocks divided in 4 block sets. The main memory contains 4096 blocks each 128 words of 16 bit length.
    a. i) How many bits are there in the main memory address?
    b. ii) How many bits are there in the cache memory address (tag, set and word field)?
15. Compare SRAM and DRAM.
16. A block-set associative cache memory consists of 128 blocks divided into four block sets. The main memory consists of 16,384 blocks and each block contains 256 eight bit words.

    How many bits are required for addressing the main memory?

    How many bits are needed to represent the TAG, SET and WORD fields?

17. A 4-way set associative cache memory unit with a capacity of 16 KB is built using a block size of 8 words. The word length is 32 bits. The size of the physical address space is 4 GB. The number of bits for the TAG field is?
18. Explain State Table method for designing of Hardwired Control Unit.