National University of Computer and Emerging Sciences, Karachi
Fall 2021 – FAST School of Computing
Class Participation Written -- Solution

Course Code: CS1005	**Course Name: Discrete Structures**
Instructor Name: Mr. Shoaib Raza	
Student Roll No:	**Section No:**

Total Time: 50 minutes **Maximum Points**: 30

(i) ABC Company hires five employees Ali, Bilal, Danish, Erum and Farhan and they have four different job posts (Business Analyst, PHP Developer, JavaScript Developer and SQA Engineer. Ali can do PHP developer job or JavaScript Developer job, Bilal can do Business Analyst job or SQA Engineer job, Danish can do JavaScript Developer job or SQA Engineer, Erum can do Business Analyst job or JavaScript Developer job and Farhan can do Business Analyst job or PHP Developer job or JavaScript Developer job. Which type of graph (write name) you can plot representing this situation, and draw this graph?

Solution: It's a Bipartite Graph($K_{5,4}$).

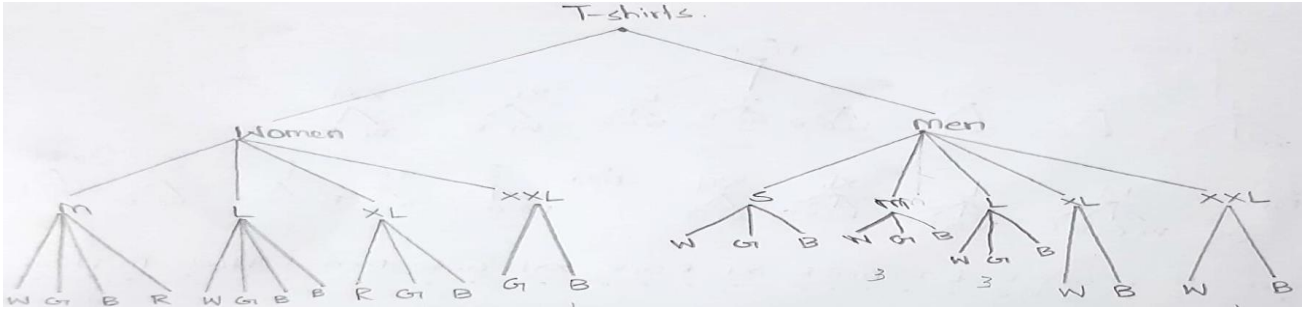
(ii) Is Graph obtained in part (i) is Planar Graph OR Non-Planar Graph? Give proper reason.

Solution: If a connected planar simple graph has e edges and v vertices with $v \geq 3$ and no circuits of length 3, then $e \leq 2v - 4$.

- $K_{5,4}$ has 9 vertices and 11 edges. Obviously, v ≥ 3 and there are no circuits of length 3.
- If $K_{5,4}$ were planar, then $e \leq 2v - 4$ would have to be true.
- $2v - 4 = 2*9 - 4 = 14$
- So e must be ≤ 14. But $e = 11$. Hence $K_{5,4}$ is planar graph.

Scenario: Suppose that a popular company launches "Nothing is like 127.0.0.1" for both men and women. Women T-shirts come in four different sizes: M, L, XL, and XXL. Each size comes in four colors (white, red, green, and black), except XL, which comes only in red, green, and black, and XXL, which comes only in green and black. Men T-shirts come in five different sizes: S, M, L, XL, and XXL. Each size comes in three colors (white, green, and black), except XL and XXL, which comes only in white and black.(iii) Use a tree diagram to determine what is the minimum number of T-shirts that the shop needs to stock to have one of each size and color available for both men and women?

Solution: 26 T-shirts needed to be stocked.



(iv) Consider the tree obtained in part (iii). Show how many internal vertices and leaves the tree has? Determine the height of the tree?

Solution: Internal vertices: 12, Leaves: 26, Height: 03

(v) Consider the tree obtained in part (iii).

(a) Determine whether it is a Full m-ary tree or not? Give reason.

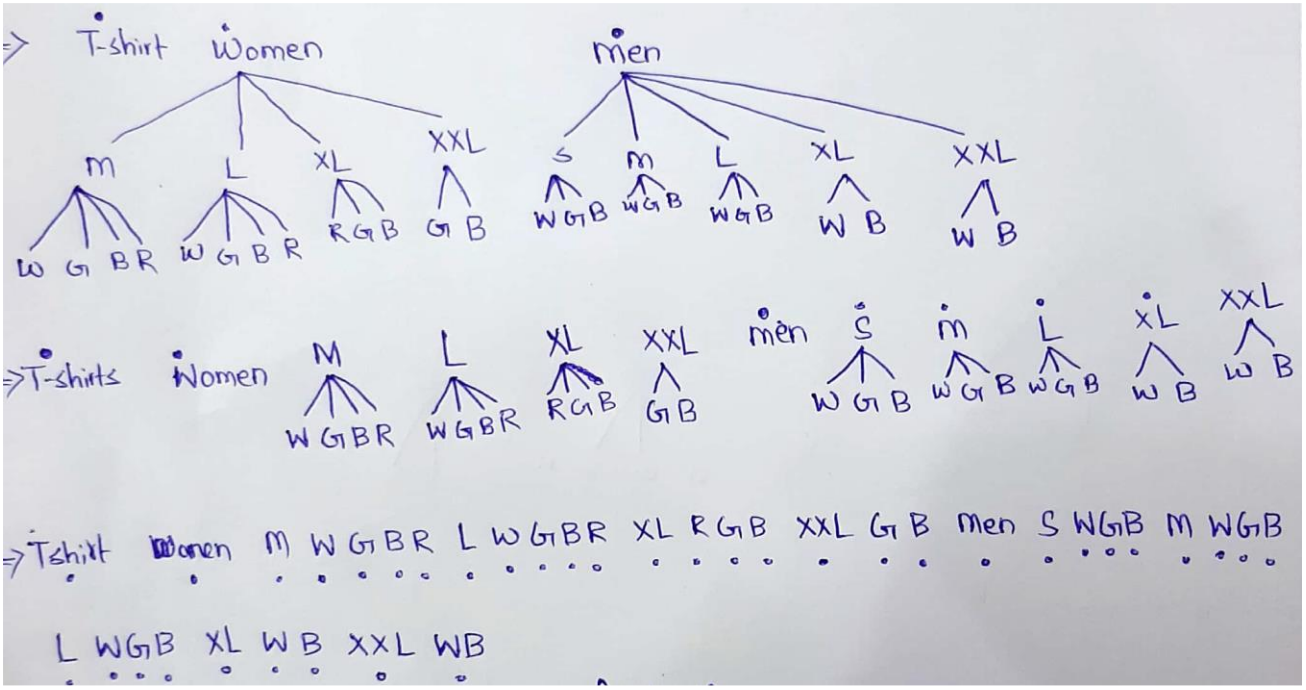
Solution: It is not fill m-ary trees all the internal vertices have different no. of children.

(b) Determine whether it is a Balanced m-ary tree or not? Give reason.

Solution: It is balanced m-ary trees as all the leaves are at h- level.

(vi) Show the Preorder and Postorder traversal of the tree obtained in part (iii).

Preorder Traversal:



Postorder Traversal: