



**PRESIDENCY UNIVERSITY
BENGALURU
SCHOOL OF ENGINEERING**

MAKE UP EXAMINATION – JAN 2023

Roll No.

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Course Code: CSE2017

Course Name: Graph Theory and Combinatorics

Program : B.Tech

Date: 24-JAN-2023

Time: 01:00 PM – 04:00 PM

Max Marks: 100

Weightage: 50%

Instructions:

- (i) *Read the questions properly and answer accordingly.*
 - (ii) *Question paper consists of 3 parts.*
 - (iii) *Scientific and non-programmable calculators are permitted.*
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Part A [Memory Recall Questions]

Answer all the questions. Each question carries THREE marks. (6Q x 3M = 18M)

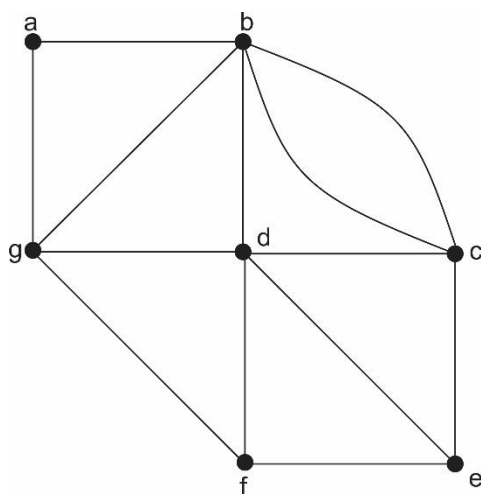
1. Among a group of students, 49 study Physics, 37 study English and 21 study Biology. If 9 of these students study Physics and English, 5 study English and Biology, 4 study Physics and Biology and 3 study Physics, English and Biology, find the number of students in the group. (C.O.No.1) [Knowledge]
2. Can there be a graph with 10 vertices such that 3 of the vertices have degree 2 each and the remaining 8 vertices have degree 5 each? (C.O.No.2) [Knowledge]
3. Define regular graph with example. (C.O.No.2) [Knowledge]
4. Draw a cubic graph and $K_{1,8}$ graph. (C.O.No.3) [Knowledge]
5. Define Eulerian graph with an example. (C.O.No.3) [Knowledge]
6. Define spanning tree of a graph G and give an example. (C.O.No.4) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the questions. Each question carries TEN marks. (5Q x 10M = 50M)

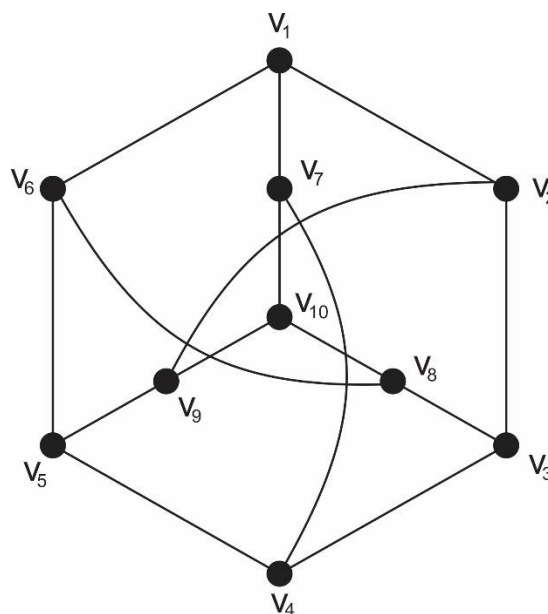
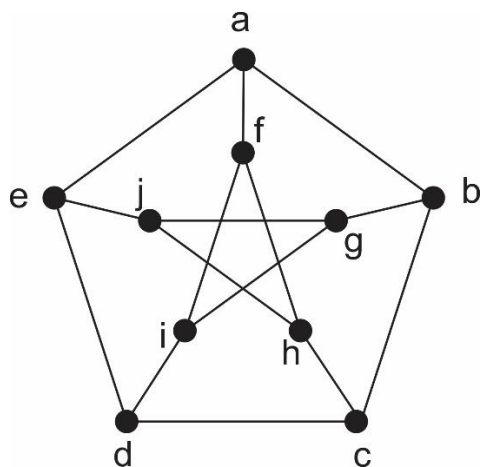
7. Five teachers T_1, T_2, T_3, T_4 and T_5 are to be made class teachers for five classes C_1, C_2, C_3, C_4 and C_5 , one teacher for each class. T_1 and T_2 do not wish to become class teachers for C_1 or C_2 , T_3 and T_4 for C_4 or C_5 , and T_5 for C_3 or C_4 or C_5 . In how many ways can the teachers be assigned the work? (C.O.No.1) [Comprehension]

8. Find the adjacency matrix and incidence matrix of the following graph.



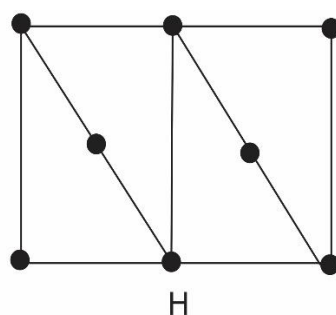
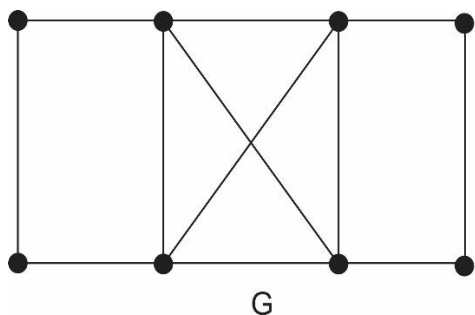
(C.O.No.2) [Comprehension]

9. (a) Check if the following graphs are isomorphic.

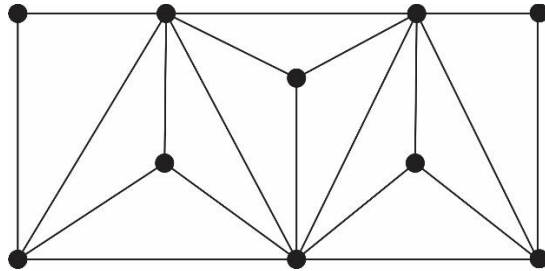


(C.O.No.2) [Comprehension]

(b) Check if the following graphs G and H are Euler graph as well as Hamiltonian graph.



- 10.(a) Prove that the complete graph K_5 is a non-planar graph.
(b) Assign colors and find the chromatic number of the following graph.



(C.O.No.3) [Comprehension]

- 11.(a) Define binary search tree with an example. Form a binary search tree for the following names: Dawn, Dave, Mike, David, Gina, Path, Beth, Cindy, Sue, Art, Pam using the alphabetical order.
(b) Suppose that a tree T has 3 vertices of degree 2, 4 vertices of degree 3 and 2 vertices of degree 4. Find the number of pendant vertices in T .

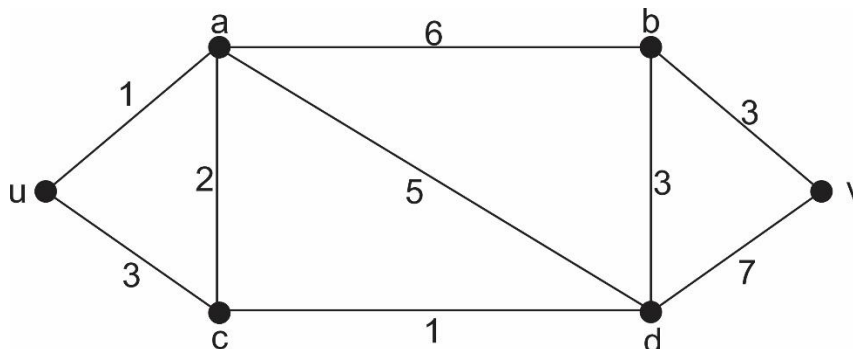
(C.O.No.4) [Comprehension]

Part C [Problem Solving Questions]

Answer all the questions. Each question carries SIXTEEN marks. (2Q x 16M = 32M)

12. Find the number of integer solutions of the equation $x_1 + x_2 + x_3 = 20$ subject to $2 \leq x_1 \leq 5$, $4 \leq x_2 \leq 7$ and $-2 \leq x_3 \leq 9$. (C.O.No.1) [Comprehension]

13. (a) Explain the Kruskal's algorithm. (C.O.No.5) [Comprehension]
(b) Apply Dijkstra's algorithm to the following graph to find the shortest path from u to v .



(C.O.No.5) [Application]