

QP CODE: D2BAM2502

(Pages: 4)

Reg. No :

Name :

SECOND SEMESTER FYUGP EXAMINATION, APRIL 2026

(Regular/Improvement/Supplementary)

Discipline Specific Core (DSC) Courses - Minor

AMA2MN104 : Graph Theory and Automata

(Credits: 4)

Time: 2 Hours

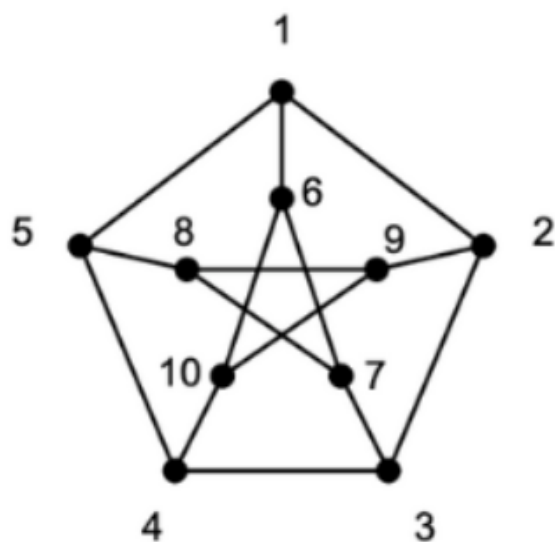
Maximum Marks: 70

Section A

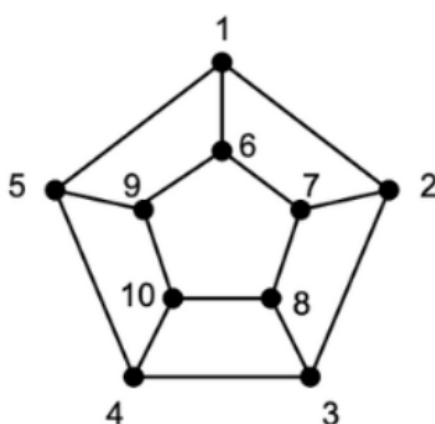
Answer the following questions. Each carries 3 marks (Ceiling: 24 marks)

1. Write the adjacency matrix of the graph given below.

BL2 CO1

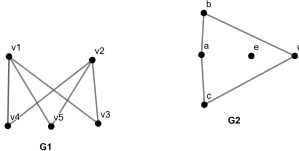
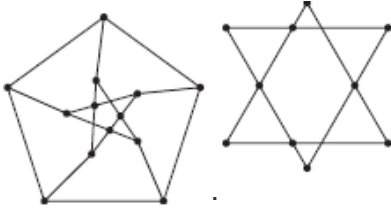
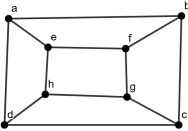


(a) G_1



b) G_2

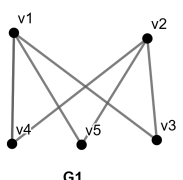
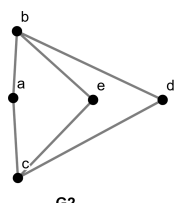
(PTO)

2.	Verify whether the graph given below are connected or not. Explain.	BL2 CO1
		
3.	Verify Euler's formula for each connected planar graph.	BL2 CO1
		
4.	Let $N=\{A, B, \sigma\}$, $T=\{a,b\}$ and $P=\{\sigma \rightarrow aA, A \rightarrow bA, A \rightarrow a\}$. Then $G=(N,T,P,\sigma)$ is a grammar. Construct a derivation tree for word ab^4a	BL2 CO2
5.	Draw C_3 , W_3 , and W_4 .	BL1 CO1
6.	The vertex set and edge set of two graphs G_1, G_2 are given below. Draw graphs G_1 and G_2. $G_1 : V_1 = \{a,b,c,d,e,f,g\}; E_1 = \{\{a,b\}, \{a,d\}, \{b,c\}, \{b,d\}, \{b,e\}, \{b,f\}, \{c,g\}, \{d,e\}, \{e,f\}, \{f,g\}\}$ $G_2: V_2 = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7\}$ $E_2 = \{\{v_1, v_4\}, \{v_1, v_5\}, \{v_1, v_7\}, \{v_2, v_3\}, \{v_2, v_6\}, \{v_3, v_5\}, \{v_3, v_7\}, \{v_4, v_5\}, \{v_5, v_6\}, \{v_5, v_7\}, \{v_3, v_5\}, \{v_3, v_7\}, \{v_4, v_5\}, \{v_5, v_6\}, \{v_5, v_7\}\}$	BL2 CO1
7.	a) For the graph given below, write down a hamiltonian circuit that that starts at x_3. b) How many vertices are there in a Hamiltonian circuit found in part(1). c) How many edges are there in the Hamilttonian circuit found in part (1). 	BL2 CO1, CO2

8.	Give the chromatic number of $K_{m,n}$. Show the coloring of $K_{2,3}$.	BL2	CO1
9.	Define alphabet. Give two examples.	BL1	CO3
10.	Create a grammar to produce the language $\{b^n ab^n \mid n \geq 0\}$	BL2	CO3

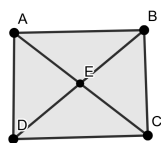
Section B

Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)

11.	Are the graphs given below are isomorphic? Justify.	BL3	CO1
 			
12.	In a fully connected network of 4 computers (each computer is connected to every other computer), how many distinct communication links of length 1 are possible.	BL3	CO2
13.	Prove that a connected graph with n vertices is a tree if and only if it has exactly $n-1$ edges.	BL1	CO1
14.	Let $\Sigma = \{a, b, c\}$ and $A = \{a, ab\}$, $B = \{b, ab\}$ and $C = \{\lambda, b, bc\}$. Verify that a) $A(B \cup C) = AB \cup AC$ b) $A(B \cap C) \subseteq AB \cap AC$	BL2	CO3
15.	Let A , B and C be arbitrary languages over Σ . Prove that $A(B \cap C) \subseteq AB \cap AC$	BL2	CO3
16.	Draw the graph $G=(V, E)$ where $V= \{a, b, c, d, e\}$ $E=\{ab, bc, cd, de, ae\}$. Verify whether the graph is bipartite or not. Justify your answer.	BL2	CO1
17.	a) For what values of n does the graph K_n contain an Euler circuit? Explain. b) For what values m and n does the graph $K_{m,n}$ contain an Euler path, an Euler circuit? Explain.	BL2	CO2
(PTO)			

18. Find the number of spanning trees of the graph given below. Show details of work.

BL3 CO1

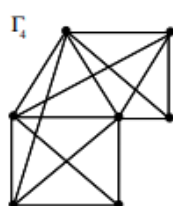
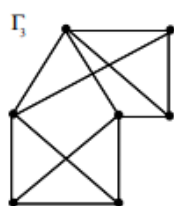
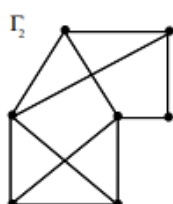
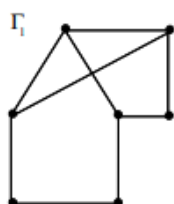


Section C

Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)

19. Determine whether each of the following graphs given is planar. If a graph is planar, exhibit a planar drawing of the graph and verify that Euler's formula holds for this representation of the graph. If a graph is not planar, provide an argument which proves that the graph cannot be planar.

BL3 CO1



20. a) Draw a transition diagram for determining if an input string over the alphabet $\{a,b\}$ contains abba as a substring.
b) Write the transition function and transition table.

BL1 CO3

CO : Course Outcome

BL : Bloom's Taxonomy Levels (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)