বিদ্যাসাগর বিশ্ববিদ্যালয়

VIDYASAGAR UNIVERSITY

B.Sc. Honours Examination 2021

(CBCS)

4th Semester

MATHEMATICS

PAPER—SEC2T

Full Marks : 40

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

SEC2T : GRAPH THEORY

Answer any *two* questions. 2×15

1. (a) Show that in a simple graph with n number of vertices and k number of components can have at most $\frac{1}{2}(n-k)(n-k+1)$ edges.

(b) Draw the graph whose incidence matrix is given below

$$\begin{pmatrix} 0 & 0 & 1 & -1 & 1 \\ -1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & -1 \\ 0 & -1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 1 & 0 \end{pmatrix}$$

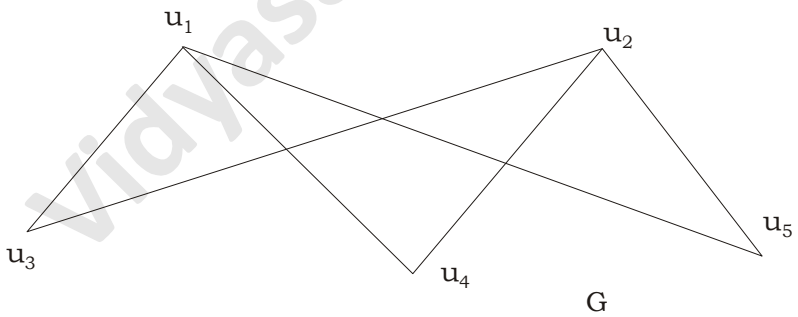
(c) Prove that a graph G has a spanning tree if and only if G is connected. 5+5+5

2. (a) Prove that a graph is a tree if and only if it is minimally connected.

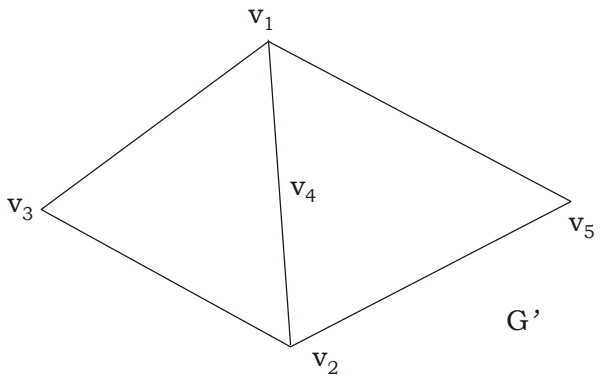
(b) (i) Prove that in a group of seven persons it is impossible that each one has friendship with exactly three persons in the group.

(ii) Let G be a simple graph having n vertices and $\bar{G}$ be its complement. For any arbitrary vertex v of G, show that deg(v) *in* G + deg(v) *in* $\bar{G}$ = $n-1$.

(c) Examine whether the following two graphs G & G' are isomorphic or not. 5+(3+2)+5



G

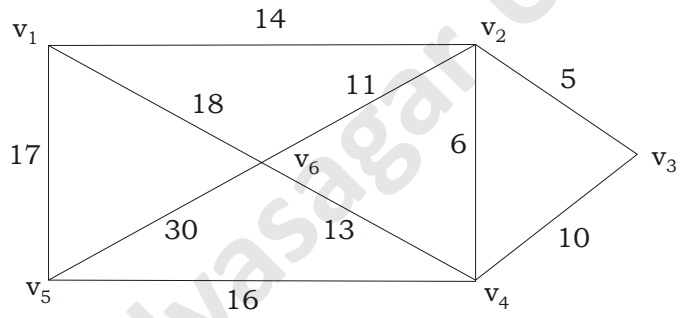


3. (a) Show that a given connected graph G is an Euler graph if and only if all vertices of G are of even degree.

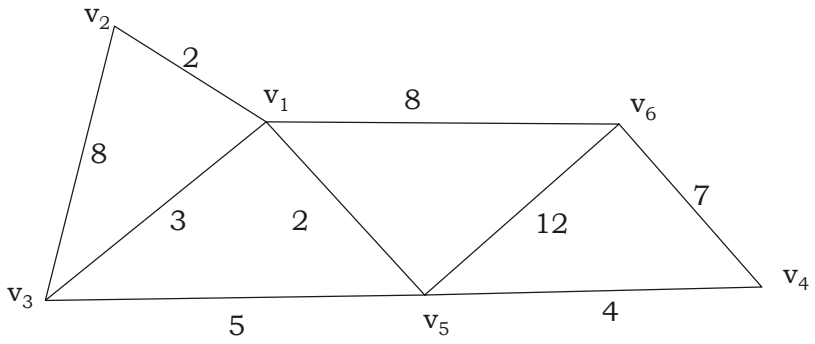
(b) Prove that a tree with n vertices has $(n - 1)$ edges.

(c) Find by Prim's algorithm a minimal spanning tree for the following graph.

5+5+5



4. (a) Find by Kruskal's algorithm a minimal spanning tree for the following graph.



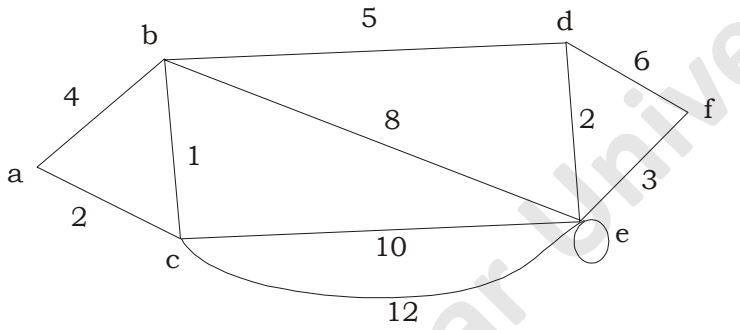
(b) (i) Prove that the number of internal vertices in a binary tree is one less than the number of pendant vertices.

(ii) Define non trivial tree. If G is a non trivial tree then show that G contains at least two vertices of degree 1.

(c) If a simple regular graph has n vertices and 24 edges, find all possible values of n. 5+(3+2)+5

Answer any *one* question. 1×10

5. Using Dijkstra's algorithm find the shortest path from the vertex a to f in the following graph. 10



6. (a) Prove that the minimum number of edges in a connected graph with n vertices is n–1.

(b) Explain the following terms with diagrams :

(i) Diameter of a connected graph

(ii) Hamiltonian Circuit

(iii) Complete bipartite graph

(iv) Fundamental cut set

(v) Complement of a graph. 5+5

SEC2T : COMPUTER GRAPHICS

Answer any *two* questions. 2×15

1. (a) Use the Cohen-Sutherland algorithm to clip the line P_1 (7,10) & P_2 (100,10) against a window left hand corner (50,10) and upper right hand corner (80,40).

(b) Construct enough points on the Bezier curve whose control points are P_0 (4,2), P_1 (8,8), P_2 (16,4) to draw an accurate sketch.

(i) What is the degree of the curve ?

(ii) What are the coordinates at μ = 0.5 ? 8+7

2. (a) Explain the term parallel projection.

(b) Translate the Square ABCD whose coordinates are A(0,0), B(3,0), C(3,3), D(0,3) by 2 units in both direction and then scale it by 1.5 units in x-direction and 0.5 units in y-direction.

(c) Explain the term shearing transformation. 5+5+5

3. (a) Discuss the properties of the Bezier and B Spline Curves.

(b) Prove that two 2D rotation about origin commute.

(c) What is pixels ? Explain the frame buffer in 600*400 pixel, how many K bytes does a frame buffer need ? 5+5+5

4. Write Short note on :

(a) Windowing and Viewpoint.

(b) 3D Clipping.

(c) 3D Geometric Primitives. 5+5+5

Answer any *one* question. 1×10

5. Explain DDA line drawing algorithm with an example. 10

6. Write all the steps of midpoint circle generating algorithm. 10

SEC2T : OPERATING SYSTEM : LINUX

Answer any *two* questions. 2×15

1. (a) What are the different between process and thread ?

(b) What are the function of fork () and exec () in process management ?

(c) Describe about the different Zones of physical memory in LINUX system.

(d) Write a short note on process states. 3+4+3+5

2. (a) Explain Swapping and Paging policy of virtual memory management system in LINUX.

(b) Write a short note on LINUX security.

(c) What are the different file systems supported by LINUX ?

(d) Explain the commands mv and chown with examples. 5+5+3+2

3. (a) Explain Starvation and Aging.

(b) Write a short note on Ext3 file system.

(c) What is Journaling file system of Linux ?

(d) What is critical section ? 4+4+4+3

4. (a) Explain design principles of LINUX system.

(b) What are the functions of an operating system ?

(c) Write a short note on Kernel mod execution.

(d) List the advantages of multiprogramming. 7+3+3+2

Answer any *one* question. 1×10

5. Explain the process management model of LINUX OS.

6. Explain Kernel synchronization of LINUX OS.

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