2019

B.Sc. (Honours)

4th Semester Examination

MATHEMATICS

Paper - SEC2T

Full Marks : 40   Time : 2 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.
Illustrate the answers wherever necessary.

1. Answer any **two** from the following :   2×2

   (a) Define isolated vertex and pendent vertex.

   (b) Is it possible to construct a graph with 11
       vertices such that 2 vertices has degree 3 and
       remaining vertices of degree 4? What will be the
       number of edges?

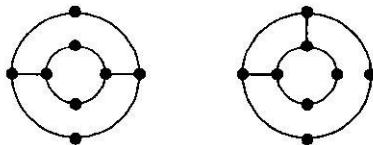   (c) Define complete and Bipartite graph with
       example.

[Turn Over]

(2)

2. Answer any *one* from the following : 5×1

   (a) Show that a simple graph with n vertices and k-components can have at most

   $$\frac{(n-k)(n-k+1)}{2} \text{ edges.} \qquad 5$$

   (b) (i) Define isomorphism of a graph. Are the following figures isomorphic? Justify? 1+2

   (ii) Prove that the number of edges in a bipartite graph with n vertices is at most

   $$\frac{n^2}{4}. \qquad 2$$

3. Answer any *two* from the followings : 5×2

   (a) Show that a given connected graph G is an Euler graph iff all vertices of G are of even degree. 5

   (b) Define Hamiltonian circuit. Show that every complete graph k_n, for all n, is a Hamiltonian

graph. Draw a connected 3-regular graph containing a bridge. $1+2+2$

(c) Let adjacent matrix of a graph G is given by

$$A(G) = \begin{bmatrix} 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 0 \end{bmatrix}$$

Find the nature of the graph, the number of vertices and edges. Also draw the graph. 5
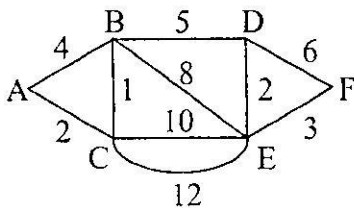
4. Answer any *two* from the followings : 2×2

(a) Define out degree and indegree of a directed graph with example.

(b) Find the rank and nullity of the complete graph k_n and complete bipartite graph $k_{m,n}$.

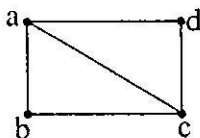(c) Prove that a graph has no cut vertex if every pair of vertices contained in same circuit.

[Turn Over]

5. Answer any *one* from the followings :   10×1

  (a) Write down Dijkstra's algorithm and find the shortest path from the vertex A to F in the following graph using this method.   10

  (b)(i) Find all possible spanning trees of the graph

                                        4

  (ii) Prove that if an edge is added to a tree it must produce a circuit.   3

  (iii) Show that every tree with $n(\geq 2)$ vertices has at least two pendent vertices.   3

6. Answer any *one* from the followings :   5×1

  (a) Prove that a tree with n vertices has $(n-1)$ edges.   5

(b) Define a binary tree. Show that the number of vertices n in a strictly binary tree is always odd. Find the number of pendent vertices in a strictly binary tree.   1+2+2

7. Answer any *one* from the followings :   2×1

(a) Show that the height of a complete binary tree with n-vertices is $[\log_2(nH) - 1]$.

(b) Show that every connected graph has at least one spanning tree.

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Computer Graphics

1. Answer any *five* questions :   2×5

(a) What is pixels? Explain the frame buffer. in 600*400 pixel, how may K bytes does a frame buffer need?

(b) What do you understand by horizontal and vertical retrace in raster system?

(c) What do you understand by homogenous co-ordinate?

(d) What is shearing transformation?

(e) What do you understand by parallel projection?

(f) Discuss the properties of the Bezier and B-Spline curves?

(g) What are 3-D transformation?

(h) Prove that two 2D rotation about origin; commute i.e. R1R2 = R2R1.

2. Answer any *four* questions :   5×4

(a) Translate the square ABCD whose co-ordinate are $A(0, 0)$, $B(3, 0)$, $C(3, 3)$ and $D(0, 3)$ by 2 units in both directions and then scale it by 1.5 units in x-direction and 0.5 units in y-direction.

(b) Use the Cohen-Sutherland algorithm to clip line $P_1(70, 10)$ and $P_2(100, 10)$ against a window lower left hand corner (50, 10) and upper right hand corner (80, 40).

(c) 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 co-ordinates at $\mu = 0.5$?

(d) Explain the following :

    (i) A-buffer

    (ii) Z-buffer

(e) Write short note on :

    (i) Windowing and Viewport

    (ii) 3-D Clipping

    (iii) 3-D geometric primitives

3. Answer any *one* question : 10×1

  (a) Explain DDA line drawing algorithm with example.

  (b) Write all the steps of mid point circle generating algorithm?

[Turn Over]

Operating System : Linux

1. Answer any *five* questions :   2×5

   (a) Define operating system and list the basic services provided by operating system.

   (b) What are differences between macro kernel and micro kernel?

   (c) Justify whether following statements are true or false

      (i) The user application interacts directly with O.S.

      (ii) Shell is part of operating System

   (d) What is a boot loader?

   (e) Explain the cut command.

   (f) Write a note on the contents of the etc/passwd file.

   (g) What are the duties of a system administrator?

   (h) What is meant by Linux disk management?

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2. Answer any *four* questions : 5×4

(a) Explain the following commands with examples :
ls, rm, cp, mv, chown, chmod.

(b) Which are the differnt file systems supported by Linux? Which feature of Linux makes this support possible (Virtual File Systems Layer)?

(c) Describe the following commands: chown, chmod, expr.

(d) Explain the purpose of the following files : /etc/hosts.conf,/etc/hosts,/etc/resolv.conf

(e) Write a note on telnet, ftp, rsync, and rsh. Why are these services called insecure services?

(f) Write short notes on : (a) message passing (b) shell

3. Answer any *one* question : 10×1

(a) (i) What are the design principles of Linux operating systems? Explain.

(ii) Explain the process management model of linux operating system.

[Turn Over]

(b) Write short notes on (any *two*) :   5×2

   (i) Process states

   (ii) Critical section

   (iii) Race condition

   (iv) Starvation

   (v) Linux Security

   (vi) Ext3 file system

   (vii) Pipes

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