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UG/4th Sem/MATH/H/19

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 ]

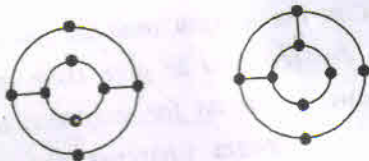
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2. Answer any *one* from the following : 5×1

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

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

(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

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

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

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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  $K_{m,n}$ .

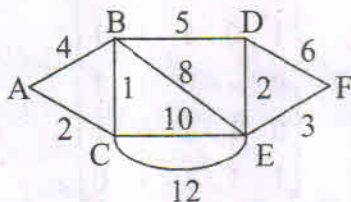
(c) Prove that a graph has no cut vertex if every pair of vertices contained in same circuit.

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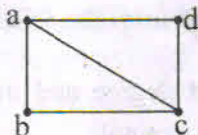
5. Answer any *one* from the followings :  $10 \times 1$

- (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

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(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 :  $5 \times 1$

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

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- (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 :  $2 \times 1$

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

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

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### Computer Graphics

1. Answer any *five* questions :  $2 \times 5$

- (a) What is pixels? Explain the frame buffer. in  $600 \times 400$  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?

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- (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.  $R_1R_2 = R_2R_1$ .

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  $\mu = 0.5$ ?

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(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?



2. Answer any *four* questions : 5×4

- (a) Explain the following commands with examples :  
ls, rm, cp, mv, chown, chmod.
- (b) Which are the different 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.

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(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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