B.A./B.Sc 4th Semester (Honours) Examination, 2019 (CBCS)

Subject : Mathematics

Paper : BMH4SEC 21

(Graph Theory)

Time: 2 Hours **Full Marks: 40**

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

[Notation and Symbols have their usual meaning.]

Group-A

Marks : 10

1. Answer *any five* questions: 2×5=10

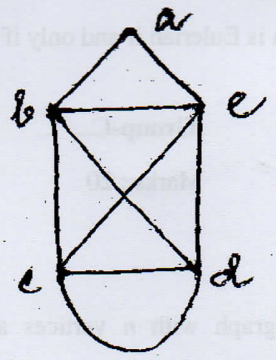
(a) Define a graph.

(b) How many vertices are there in a graph with 15 edges if each vertex is of degree 3?

(c) Define a Bipartite graph. Give an example of it. 1+1=2

(d) Define Adjacency Matrix of a graph.

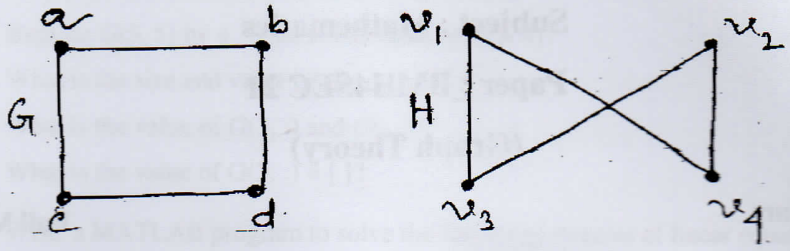
(e) Define Euler circuit. Find, if possible, an Euler circuit in the following graph. 1+1=2



(f) Define a Tree and a Binary Tree. 1+1=2

(g) Define a spanning tree with graphical representation.

(h) Examine whether the following two graphs are isomorphic or not.



Group-B

Marks : 10

2. Answer *any two* questions: 5×2=10

(a) Give an example in each of the following case:

(i) An Eulerian graph which is not Hamiltonian.

(ii) A Hamiltonian graph which is not Eulerian.

(iii) A graph which is both Eulerian and Hamiltonian.

(iv) A graph which is neither Eulerian nor Hamiltonian.

(b) Prove that every walk in a graph between two vertices u and v contains a path between u and v.

(c) Prove that a connected graph with n-vertices is a tree if and only if it has exactly $(n - 1)$ edges.

(d) Prove that a connected graph is Eulerian if and only if the degree of each vertex is even.

Group-C

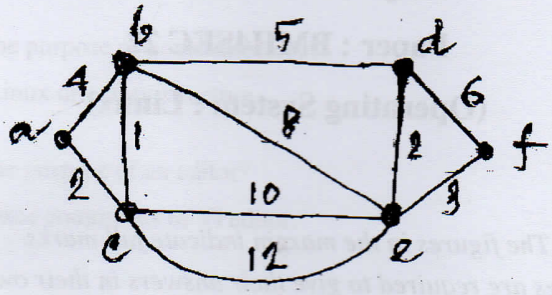
Marks : 20

3. Answer *any two* questions: 10×2=20

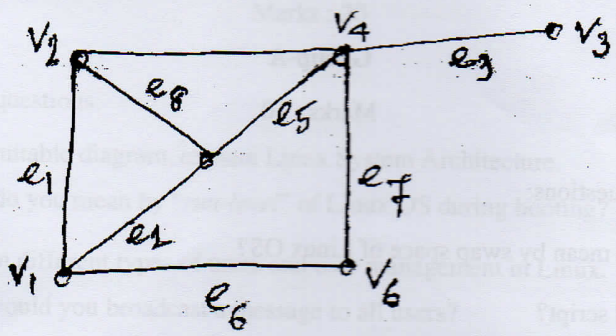
(a) (i) Prove that a simple graph with n vertices and k components can have at most $\frac{(n-1)(n-k+1)}{2}$ edges.

(ii) Prove that the maximum number of edges in a connected simple graph with n vertices is $\frac{n(n-1)}{2}$. 6+4=10

(b) (i) Applying Dijkstra's method find the shortest path and distance between the two vertices a and f in the given following graph.



(ii) Determine the adjacency matrix of the given graph: 5+5=10



(c) Write short notes on the following:

(i) The travelling salesman problem

(ii) Königsberg Bridge Problem 5+5=10

(d) (i) Obtain a necessary and sufficient condition for a simple graph to be bipartite.

(ii) Define a minimally connected graph. Prove that a graph is minimally connected if and only if it is a tree. 5+(1+4)=10

B.A./B.Sc 4th Semester (Honours) Examination, 2019 (CBCS)

Subject : Mathematics

Paper : BMH4SEC 22

(Operating System : Linux)

Time: 2 Hours **Full Marks: 40**

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

Group-A

Marks : 10

1. Answer *any five* questions: 2×5=10

(a) What do you mean by swap space of Linux OS?

(b) What is shell script?

(c) What is '*x*-window system'?

(d) What do you mean by Kernel of Linux OS?

(e) What is boot loader? Give example.

(f) Write two features of Linux.

(g) What do you mean by super user?

(h) How to add a user in linux?

Group-B

Marks : 10

2. Answer *any two* questions: 5×2=10

(a) (i) State the purposes of the following commands:

(I) *cp*

(II) *mv*

(III) *rm*

(ii) What is the role of Richard Stallman with respect to Linux? 3+2=5

(b) (i) Explain different file-types in Linux.

(ii) Differentiate between hard-link and soft-link. 3+2=5

(c) (i) What is the purpose of home directory?

(ii) Discuss Linux directory structure. 1+4=5

(d) (i) What is the purpose of an editor?

(ii) Discuss three commands of Vi editor. 2+3=5

Group-C

Marks : 20

3. Answer *any two* questions: 10×2=20

(a) (i) With suitable diagram, explain Linux System Architecture.

(ii) What do you mean by "*run-level*" of Linux OS during booting? 8+2=10

(b) (i) Explain different types of users and user management in Linux.

(ii) How would you broadcast a message to all users? 8+2=10

(c) (i) What are the different advantages of Linux over UNIX?

(ii) Discuss the role of root in Linux Operating System. 5+5=10

(d) Discuss the purposes of the following commands in brief: 4+4+2=10

(i) *cut*

(ii) *grep*

(iii) *ls*

B.A./B.Sc 4th Semester (Honours) Examination, 2019 (CBCS)

Subject : Mathematics

Paper : BMH4SEC 23

(MATLAB Programming)

Time: 2 Hours **Full Marks: 40**

The figures in the margin indicate full marks.
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Group-A

Marks : 10

1. Answer *any five* questions: 2×5=10

(a) What will be the output of the following MATLAB commands?

$\gg r = [8\ 12\ 9\ 4\ 23\ 19\ 10]$

$\gg s = r <= 10$

(b) Explain MATLAB Commands '*clc*' and 'clear XYZ'.

(c) Write a 'for' loop that will print the real numbers from 1·5 to 3·1 with step 0·2.

(d) Use MATLAB Commands to evaluate the following expression.

$(\sqrt{2} - 4i)(\sqrt{3} + 3i)$

(e) Explain the MATLAB Commands '*ceil*(*x*)' and '*floor*(*x*)'.

(f) What will be the output of the following MATLAB Commands?

$\gg a = eye\ (3,3);$

$\gg b = [4\ 5\ 6];$

$\gg a(:,3) = b';$

$\gg disp(a)$

(g) What are the purposes of MATLAB Command Window and the Figure Window?

(h) Explain the format of the MATLAB Commands '*f plot*' and '*legend*'.

Group-B

Marks : 10

2. Answer *any two* questions: 5×2=10

(a) Explain script file and function file in MATLAB with example. 3+2=5

(b) Write the MATLAB program to plot the function $y(x) = 4x^4 - 25x^2 + 12$, and its first and second order derivatives for $-5 \leq x \leq 5$ in the same figure.

(c) Let 'a' and 'b' be two matrices with required ordering. Write down the difference among a/b, $a\backslash b$ and $a \cdot/b$ with proper examples.

(d) What will be displayed, when you run the following codes?

(i) $\gg a = 0;$

$\gg$ while $a < 10$

$\gg a = a + 3;$

$\gg$ end

$\gg$ disp(a)

(ii) $\gg B$ = [*ones* (3) *zeros* (3,2); *zeros*(2, 3) 4**eye*(2)] 2½+2½=5

Group-C

Marks : 20

3. Answer *any two* questions: 10×2=20

(a) (i) Explain '*if-else if-else*' statements in MATLAB with proper example.

(ii) Create a vector of five random integers in the range from –10 to 10 and then perform each of the following using loops.

(I) subtract 3 from each element.

(II) Find the maximum and minimum elements.

(iii) Explain '*fopen*' and '*fread*' file commands in MATLAB. 3+(2+1+1)+3=10

(b) Do the following operations on matrix

$$G = \begin{pmatrix} 2 & 6 & 0 & 5 & 3 & 7 \\ 3 & 9 & 1 & 0 & 0 & 2 \\ 0 & 0 & 1 & 2 & 6 & 3 \\ 1 & 5 & 3 & 4 & 7 & 0 \\ 0 & 0 & -1 & 1 & -3 & 2 \\ 3 & 0 & 0 & 1 & 5 & 3 \end{pmatrix}$$

by MATLAB Command :

(i) Delete the last row and column from the matrix.

(ii) Replace $G(5, 5)$ by 4. What is the value of $G(1, 4)$?

(iii) What is the size and value of $G(:, 1{:}2{:}5)$?

(iv) What is the value of $G(3, :)$ and $G(:, 3)$?

(v) What is the value of G(3, :) = [ ]? 2+2+3+2+1=10

(c) (i) Write a MATLAB program to solve the following systems of linear equations.

$$\begin{aligned} 2x + 3y + 4z &= 5 \\ x + y + 4z &= 10 \\ -2z + 3x + 4y &= 0 \end{aligned}$$

(ii) Write a MATLAB program that will find the following expression for given n.

$$S = \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \cdots + \frac{1}{n!}$$

(iii) Write a MATLAB statements to calculate the value of $y(t)$ from the following:

$$y(t) = \begin{cases} -3t^2 + 5, & t \geq 0 \\ 3t^2 + 5, & t < 0 \end{cases}$$

for values of t between –9 and 9 with step-size 0·5. 3+4+3=10

(d) (i) Write M-file to evaluate the function $y(x) = x^2 - 3x + 2$ for all values of x between 2 and 3 with step size 0·1. Do this twice, once with a '*for loop*' and then with vector operation.

(ii) Create a 6×6 matrix in which the elements of middle two rows and columns are 3's and rest are 4's using MATLAB Commands '*eye*(*n*)', '*ones*(*n*)' and '*zeros*(*m,n*)'.

(iii) Construct the function of the squares and cubes of the elements of vector in MATLAB.

4+4+2=10