Total No. of Questions : 5]

SEAT No. :

**P5143**

[Total No. of Pages : 3

# [5823]-401

## S.Y.B.Sc.

## COMPUTER SCIENCE

## CS 241 : Data Structure and Algorithms - II

## (2019 CBCS Pattern) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 35*

***Instructions to the candidates:***

1) ***Figures to the write indicate full marks.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Your answers will be values as a whole.***

***Q1)*** Attempt any EIGHT of the following. **[8 × 1 = 8]**

a) Define Heap.

b) List tree traversal methods.

c) Define node of tree.

d) What is height balance tree?

e) Define balance factor.

f) Define Spanning tree.

g) Define in-degree & out-degree of vertex.

h) What is weighted graph.

i) Define Bucket

j) What do you mean by rehashing.

***Q2)*** Attempt any Four of the following. **[4 × 2 = 8]**

a) Write any two properties of hash function.

b) Define i) Degree of vertex

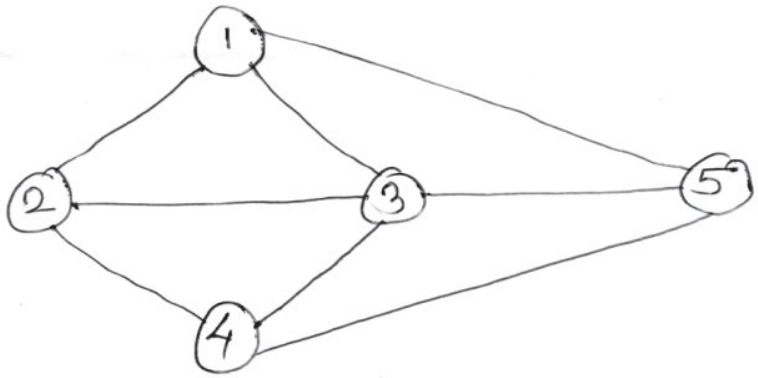
ii) Subgraph

c) List any two applications of tree data structure.

d) What is skewed binary tree.

***P.T.O.***

e) Convert the following undirected graph into adjacency matrix.




***Q3)*** Attempt any Two of the following. **[2 × 4 = 8]**

a) Write a program to sort 'n' randomly generated elements using heapsort method.

b) Write a program that accepts the vertices and edges of graph and store it as an adjacency matrix. Display adjacency matrix.

c) Write a function to search an element in binary search tree.

***Q4)*** Attempt any Two of the following. **[2 × 4 = 8]**

a) Construct an AVL tree for the following data.

70, 50, 30, 90, 80, 130, 120

b) Consider the following adjacency matrix.

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1 | 0 | 1 | 1 | 0 |
| 2 | 1 | 0 | 1 | 0 |
| 3 | 0 | 0 | 0 | 1 |
| 4 | 1 | 0 | 0 | 0 |

i) Draw the graph

ii) Draw Adjacency list.

c) Write a C function to traverse a graph using BFS.

*Q5)* Attempt any ONE of the following. **[1 × 3 = 3]**

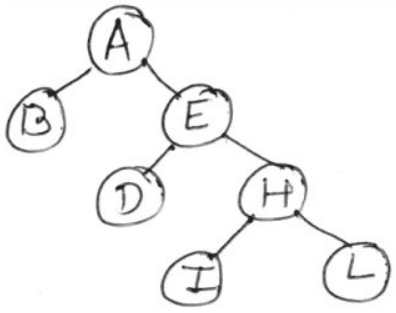
a) Define the following terms.

i) Height of tree

ii) Forest

iii) Siblings of tree

b) Traverse the following tree using preorder, inorder and postorder traversal techniques.



Total No. of Questions : 5]

SEAT No. :

P5144

[Total No. of Pages : 2

# [5823]-402

## S.Y. B.Sc.

## COMPUTER SCIENCE

## CS - 242 : Computer Networks - I

## (2019 Pattern) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 35*

***Instructions to the candidates:***

1) ***All questions are compulsory.***
2) ***Neat diagram must be drawn if necessary.***

***Q1)*** **Attempt any EIGHT of the following (Out of TEN).** **[8 × 1 = 8]**

a) What is Port address?

b) What is the size of IPv4 & IPv6 Address?

c) List application Layer Protocol.

d) "UDP is Connection Oriented Protocol." State the statement is true / false.

e) What is the function of Presentation layer?

f) What is Protocol?

g) Which devices operates at physical layer.

h) What is Bandwidth?

i) What is CSMA/CD?

j) Define Masking.

***Q2)*** **Attempt any FOUR of the following (Out of FIVE).** **[4 × 2 = 8]**

a) Define Terms :

i) Jitter

ii) Latency

b) Write Nyquist & Shannon's formula for calculating data rate of a channel.

c) Define routing.

***P.T.O.***

d) Define following Data communication standards:

i) De Facto

ii) De Jure

e) Apply bit stuffing on Pattern 01101111111111110010

***Q3)*** **Attempt any TWO of the following (Out of THREE).** **[2 × 4 = 8]**

a) Explain Multiplexing & De_multiplexing in transport Layer.

b) What is Taxonomy for Media Access Protocol?

c) Which are the methods of framing.

***Q4)*** **Attempt any TWO of the following (Out of THREE).** **[2 × 4 = 8]**

a) Write note on Circuit Switching.

b) For the given IP address 205.16.37.39/28 in some block of address, Calculate :

i) Address Mask

ii) First Address of block

iii) Last address of block

iv) Number of addresses in the block

c) Write note on UDP

***Q5)*** **Attempt any ONE of the following (Out of TWO).** **[1 × 3 = 3]**

a) What is BSS & ESS? Explain in detail.

b) Explain TCP/IP Model in detail.

Total No. of Questions : 3]

SEAT No. :

P5145

[Total No. of Pages : 2

# [5823]-403

## S.Y. B.Sc. (Computer Science)

## MATHEMATICS

## MTC-241 : Computational Geometry

## (2019 Pattern) (Semester - IV)

*Time : 2 Hours]* *[Max. Marks : 35*

***Instructions to the candidates:***

1) ***All Questions are compulsory.***
2) ***Figures to the right indicates full marks.***
3) ***Non-programmable scientific calculator is allowed.***

***Q1)*** Attempt any five of the following. **[5 × 2 = 10]**

a) Write transformation matrix of rotation about origin through an angle 45° in clockwise direction.

b) Find the slope of line which is perpendicular to the line $2x + y = 3$.

c) Find point in three dimensional space whose homogenous co-ordinate is $\left[1 \quad 2 \quad 3 \quad \frac{1}{2}\right]$.

d) Write matrix of overall scaling by factor 3 in three dimensional space.

e) Define foreshortning factors in projection.

f) If foreshortning factor along z-direction is $F_z = \frac{1}{2}$. What is the angle $\phi$ required to rotate about Y-axis to construct a dimetric projection.

g) Write any two properties of Be′zier curve.

***Q2)*** Attempt any three of the following : **[3 × 5 = 15]**

a) Obtain concatenated transformation matrix [T] for Axonometric projection.

b) If the line segment AB is scaled uniformly by factor 3 then find mid-point of transformed line segment A'B'. Where A = [4 9] and B = [3 2].

***P.T.O.***

c) Obtain combined transformation matrix for the following sequence of transformation. First Reflection through x-axis, followed by Rotation about origin through an angle 270°, followed by scaling in x and y direction by factors 2 and –1 units respectively.

d) Obtain transformation matrix to Reflect the object through plane $x = -2$.

e) Obtain transformation matrix to rotate the line which is parallel to y-axis and passing through point (0, 4, 0), by an angle $\theta = 45°$.

***Q3)*** Attempt any one of the following : **[1 × 10 = 10]**

a) Generate equispaced 4 point on the curve of circle $(x - 1)^2 + (y + 1)^2 = 9$.

b) i) Find parametric equation of curve determine by control points $B_0[3, 4]$, $B_1[0, 1]$ and $B_2[2, -1]$. Also find position vector of the point on the curve corresponding to parametric value t = 0.3.

ii) Write the transformation matrix for dimetric projection with $F_z = \frac{3}{8} (\theta > 0, \phi > 0)$.

Total No. of Questions : 3]

SEAT No. :

P5146

[Total No. of Pages : 4

# [5823]-404

## S.Y. B.Sc. (Computer Science)

## MATHEMATICS

## MTC-242 : Operations Research

## (2019 Pattern) (Semester - IV) (Paper - II) (24222)

*Time : 2 Hours]* *[Max. Marks : 35*

***Instructions to the candidates:***

1) ***All Questions are compulsory.***
2) ***Figures to the right indicates full marks.***
3) ***Non-programmable scientific calculator is allowed.***

***Q1)*** Attempt any Five of the following. **[5 × 2 = 10]**

a) Write two applications of Linear programming problem.

b) How an assignment problem with certain restrictions can be solved?

c) Write dual form of the following Linear programming problem :

Maximize $Z = x_1 + 3x_2$

Subject to

$3x_1 + 2x_2 \leq 6$

$3x_1 + x_2 = 4$

$x_1, x_2 \geq 0$

d) Obtain Initial Basic Feasible solution of the Transportation Problem using Matrix Minima Method.

| Destination → Origin ↓ | $D_1$ | $D_2$ | $D_3$ | Supply |
|---|---|---|---|---|
| $O_1$ | 10 | 13 | 6 | 10 |
| $O_2$ | 16 | 7 | 13 | 12 |
| $O_3$ | 8 | 22 | 2 | 8 |
| Demand | 6 | 11 | 13 | 30 |

***P.T.O.***

e) Solve the following Assignment Problem for minimization :

| Jobs → Persons ↓ | I | II | III |
|---|---|---|---|
| A | 7 | 3 | 5 |
| B | 2 | 7 | 4 |
| C | 6 | 5 | 3 |
| D | 3 | 4 | 7 |

f) Write the standard form of the following linear programming problem :

Minimize $Z = x_1 + x_2 + x_3$

Subject to :

$$x_1 - 3x_2 + 4x_3 = 5$$
$$x_1 - 2x_2 \leq 3$$
$$2x_1 - x_3 \geq 4$$
$$x_1, x_2, x_3 \geq 0$$

g) Draw the Feasible region for the following constraints :

Max $Z = 3x - 2y$

Subject to

$$x + y \leq 1$$
$$2x + 2y \geq 4$$
$$x, y \geq 0$$

***Q2)*** Attempt any three of the following : **[3 × 5 = 15]**

a) Solve the following assignment problem to minimize the cost such that Machine. $M_2$ cannot be assigned Job - C and Machine $M_3$ cannot be assigned Job - A.

| | A | B | C | D | E |
|---|---|---|---|---|---|
| $M_1$ | 9 | 11 | 15 | 10 | 11 |
| $M_2$ | 12 | 9 | - | 10 | 9 |
| $M_3$ | - | 11 | 14 | 11 | 7 |
| $M_4$ | 14 | 8 | 12 | 7 | 8 |

b) Solve the following Linear Programming Problem by Big-M method :

Maximize $Z = 3x_1 - x_2$

Subject to :

$$2x_1 + x_2 \geq 2$$

$$x_1 + 3x_2 \leq 3$$

$$x_2 \leq 4$$

$$x_1, x_2 \geq 0$$

c) Solve the following assignment problem For minimum cost :

| | A | B | C | D | E |
|---|---|---|---|---|---|
| $M_1$ | 7 | 5 | 9 | 8 | 11 |
| $M_2$ | 9 | 12 | 7 | 11 | 10 |
| $M_3$ | 8 | 5 | 4 | 6 | 9 |
| $M_4$ | 7 | 3 | 6 | 9 | 5 |
| $M_5$ | 4 | 6 | 7 | 5 | 11 |

d) Solve the Linear Programming Problem by graphically.

Max. $Z = 9x + 13y$

Subject to :

$$2x + 3y \leq 18$$

$$2x + y \leq 10$$

$$x, y \geq 0$$

e) Solve Transportation Problem by north - west corner rule.

| | I | II | III | IV | V | VI | Capacity |
|---|---|---|---|---|---|---|---|
| A | 9 | 12 | 9 | 8 | 4 | 3 | 5 |
| B | 7 | 3 | 6 | 8 | 9 | 4 | 8 |
| C | 4 | 5 | 6 | 8 | 10 | 14 | 6 |
| D | 7 | 3 | 5 | 7 | 10 | 9 | 7 |
| E | 2 | 3 | 8 | 10 | 2 | 4 | 3 |
| Requirement | 3 | 4 | 5 | 7 | 6 | 4 | |

***Q3)*** Attempt any one of the following : **[1 × 10 = 10]**

a) Find Initial Basic Feasible solution by vogel's Approximation method. Obtain the optimal solution by Modified Distribution method of the following transportation problem.

| Ware houses → Factory ↓ | $w_1$ | $w_2$ | $w_3$ | $w_4$ | Supply |
|---|---|---|---|---|---|
| $F_1$ | 19 | 30 | 50 | 10 | 7 |
| $F_2$ | 70 | 30 | 40 | 60 | 9 |
| $F_3$ | 40 | 8 | 70 | 20 | 18 |
| Requirement | 5 | 8 | 7 | 14 | 34 |

b) i) Solve the following Linear Programming problem by simplex method.

Max. $Z = 6x + 3y$

Subject to :

$2x + y \leq 8$

$3x + 3y \leq 18$

$y \leq 3$

$x, y \geq 0$

ii) Write an algorithm to solve assignment problem

Total No. of Questions : 5]

SEAT No. :

P5147

[Total No. of Pages : 2

# [5823]-405

## S.Y. B.Sc. (Computer Science)

## ELECTRONICS

## ELC-241 : Embedded System Design

## (2019 Pattern) (Semester - IV) (Paper - I)

*Time : 2 Hours]* *[Max. Marks : 35*

***Instructions to the candidates:***

1) ***Q.1 is compulsory.***
2) ***Solve any Three questions from Q.2 to Q.5.***
3) ***Figures to the right indicates full marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of calculator is allowed.***

***Q1)*** Attempt any five. **[5 × 1 = 5]**

a) Define an Embedded system.

b) Which processor is used in Raspberry pi.

c) What is the difference between Lists and Tuples?

d) What is the use of 'time' function?

e) How physical numbering scheme is selected on Raspberry pi?

f) Write the use of GSM module.

***Q2)*** Answer the following : **[2 × 5 = 10]**

a) i) Explain following functions of Python **[3]**

I) eval (str)

II) GPIO.input (channel)

III) GPIO-setup (channel, GPIO.OUT)

ii) Write Python program for LED interfacing to Raspberry pi **[2]**

b) Explain any two types of SBC in detail. List the advantages and disadvantages of SBC. **[5]**

***P.T.O.***

*Q3)* Answer the following : **[2 × 5 = 10]**

a) i) Write the functions of following blocks of Raspberry pi **[5]**

I) HDMI

II) Micro SD Card

III) USB ports

IV) Ethernet

V) Processor

b) List different types of operators used in Python. Explain any three operators in detail. **[5]**

*Q4)* Answer the following : **[2 × 5 = 10]**

a) Draw the neat diagram of architecture of SOC. Explain any three blocks of it. **[5]**

b) Explain different types of Network Access devices used for SBC along with their features. **[5]**

*Q5)* Write a short note on <u>any four</u> of the following : **[4 × 2.5 = 10]**

a) Raspberry pi and Beagle Bone SBC.

b) ARM 1176JZF-S.

c) GPIO functions.

d) Standard data types used in Python.

e) 'elif' statement.

f) Python Dictionary.

Total No. of Questions : 5]

SEAT No. :

**P5148**

[Total No. of Pages : 2

# [5823]-406

## S.Y. B.Sc. (Computer Science)

## ELECTRONICS

## ELC 242 - Wireless Communication and Internet of Things

## (2019 Pattern) (Semester - IV) (Paper-II)

*Time : 2 Hours]* *[Max. Marks : 35*

***Instructions to the candidates:***

1) ***Q. is compulsory.***
2) ***Solve any three questions from Q2 to Q5.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***

***Q1)*** Answer the following in one or two sentence each.(Any Five). **[5×1=5]**

a) Define femtocell.

b) Give any two example of public cloud.

c) What is full form of MQTT?

d) Define scalabity of IOT system.

e) What is the use of the RFID module?

f) Which modulation technique is used in bluetooth?

***Q2)*** Answer the following. **[2×5=10]**

a) Explain following topologies used in ZigBee

i) Star ii) Tree

iii) Cluster tree iv) Mesh

What is ZigBee coordinator?

b) Draw and explain smart irrigation system for agricultural field.

***P.T.O.***

***Q3)*** Answer the following. **[2×5=10]**

a) What is GSM? Give function of following blocks of NSS of GSM.

i) Visitor location Register (VLR)

ii) Home location Register (HLR)

iii) Equipment Indentify Register (EIR)

iv) Authentication Centre (AUC)

b) Write in detail transport layer of Z-wave.

***Q4)*** Answer the following. **[2×5=10]**

a) Compare LoRaWAN & Sig fox technologies.

b) Draw and explain GPRS architecture.

***Q5)*** Write a short notes (Any Four). **[4×2.5=10]**

a) Private cloud

b) Home Automation using IoT.

c) Scatternet of Bluetooth.

d) Draw block diagram of mobile handset.

e) Limitation of RFID system.

f) Frequency reuse