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S.Y. B.Sc. (Computer Science)
CS-241 : DATA STRUCTURES & ALGORITHMS - I
(CBCS) (2019 Pattern) (Semester - IV)

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

Instructions to the candidates :
1) *Neat diagrams must be drawn wherever necessary.*
2) *Figures to the right indicate full marks.*

*Q1)* Attempt any Eight of the following: [8 × 1 = 8]
   a) Define degree of a tree.
   b) Define the term left skewed binary tree.
   c) What is height balance tree?
   d) List 2 applications of graph.
   e) What is topological sorting?
   f) Define Bucket.
   g) What is collision?
   h) Define complete Binary tree.
   i) What is weighted graph?
   j) Explain open addressing concept in hash table.

Q2) Attempt any four of the following: [4 × 2 = 8]
   a) Traverse the following binary tree using given traversal technique
       i)   Inorder   ii)   Postorder.
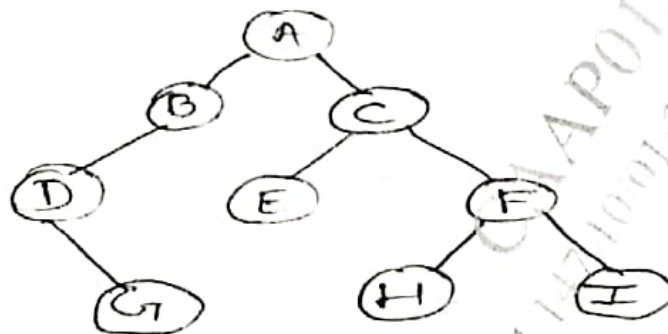
b) Compare B tree & B+ tree.

c) Define indegree & outdegree of vertex with example.

d) Explain the concept of hushing & rehashing in Hash table.

e) Explain concept of Red - Black Tree.

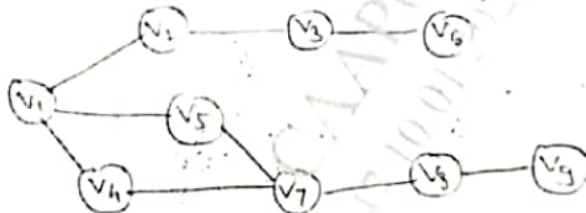**Q3)** Attempt any two: [2 × 4 = 8]

a) Write C program to represent graph as adjacency matrix.

b) Write C Program to compare two BST.

c) Write a program to find minimum value node from the BST.

Q4) Attempt any two: [2 × 4 = 8]

a) Write a program to insert an element into binary tree.

b) Construct AVL tree for the following:

   {Mon, Sun, Thur, Fri, Sat, Wed, Tue}

c) Consider the following graph.

   Give i) DFS Traversal
        ii) BFS Traversal.

Q5) Attempt any one of the following: [1 × 3 = 3]

a) Write note on quadratic probing

b) Compare the data structures.
   Tree & Graph.

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S.Y. B.Sc.

COMPUTER SCIENCE

CS-242: Computer Networks - I (Paper - II)

(2019 Pattern) (Semester - IV) (24122)

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

Instructions to the candidates :

   1)   *All questions are compulsory.*

   2)   *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt any Eight of the following :   [8 × 1 = 8]

   a)   List components of data communication.

   b)   What is data communication?

   c)   Define Protocols.

   d)   List any two channelization protocols.

   e)   State any two applications of wireless LAN.

   f)   What is bandwidth?

   g)   Define congestion.

   h)   What is Routing?

   i)   What is a Port Number?

   j)   What is internetworking?

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

a) What is Computer Network? Write any four characteristics of Computer Network.

b) What is LAN? Write any two advantages of LAN.

c) Consider a noiseless channel with a bandwidth of 4000 Hz transmitting a signal with two signal levels. What will be the maximum bit rate?

d) Write any four application of Bluetooth technology.

e) Change the following IPv4 address from binary notation to dotted decimal notation.
   i)   10000001 00001011 00001011 11101111
   ii) 11000001 10000011 00011011 11111111

Q3) Attempt any two of the following : [2 × 4 = 8]

a) Compare OSI Reference Model and TCP/IP model.

b) Explain the important design issues of the data link layer.

c) Explain the different services offered by the Network layer.

Q4) Attempt any two of the following : [2 × 4 = 8]

a) Write any four differences between Fast ethernet and Gigabit ethernet.

b) Write any eight features of IPv6 protocol.

c) Explain any four features supported by TCP.

Q5) Attempt any one of the following : [1 × 3 = 3]

a) Explain datagram format of UDP.

b) Define Pulling.

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S.Y. B.Sc. (Computer Science)
ELECTRONICS
ELC - 241 : Embedded System Design
(2019 Pattern) (Semester - IV) (Paper - I) (24321)

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 indicate full marks.
4) Neat diagrams must be drawn wherever necessary.
5) Use of calculator is allowed.

Q1) Attempt any Five :

[5 × 1 = 5]

a) State any two characteristics of an embedded system.
b) What is SoC?
c) State any two Features of Raspbian OS.
d) List the logical operators in python.
e) What is the significance of GPIO cleanup ( ) Function?
f) State applications of PIR sensors.

Q2) Answer the following :

[2 × 5 = 10]

a) i) Explain time·ctime ( ), time·clock ( ) and time. Striuct_time functions used in python. [3]
   ii) Write a python program for the division of two numbers. [2]
b) Draw neat block diagram of Single Board Computer and explain any three blocks. [5]

Q3) Answer the following :

[2 × 5 = 10]

a) Write a short on peripherals used in BCM2835. [5]
b) Explain the following statements. [5]
   i) Break   ii) Pass
   iii) Continue   iv) Try.
   v) Range

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

   a) Explain the interfacing of a switch to Raspberry Pi with the help of neat diagram and write a python program for the same. [5]

   b) List at least four types of Keyboards. Explain membrane and mechanical Keyboard in detail. [5]

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

   a) Types of memories.

   b) Branch prediction and folding.

   c) Bitwise operators used in python.

   d) Operating systems used for Raspberry Pi.

   e) CPU pipeling stages.

   f) Bluetooth Module.

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S.Y. B.Sc. (Computer Science)
ELECTRONICS
ELC 242 - Wireless Communication and Internet of Things
(2019 Pattern) (Semester - IV) (Paper - II) (24322)

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 indicate full marks.*
4) *Use of calculator is allowed.*

Q1) Attempt **any Five** of the following :
[5 × 1 = 5]

a) State the technique used to avoid interference between the neighbouring base stations.

b) Which type of RFID tag uses battery?

c) State the name of the topology not supported by Zigbee network.

d) What is full form of IoT?

e) What do you mean by M2M communication?

f) State any two challenges faced while implementing IoT.

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

a) Draw neat diagram and explain architecture of smart home system.

b) Write comparison between Bluetooth and Zigbee.

P.T.O.

Q3) Answer the following : $[2 \times 5 = 10]$

    a)   Explain three segments of GPS.

    b)   i)   State the advantages of wireless communication.

            ii)   What is frequency reuse concept of cellular telephony system.

Q4) Answer the following : $[2 \times 5 = 10]$

    a)   Compare wired and wireless communication.

    b)   Differentiate between M2M and IoT.

Q5) Write a short note on **any Four** of the following : $[4 \times 2\frac{1}{2} = 10]$

    a)   Public Cloud.

    b)   Secure Connectivity and secure data storage in IoT.

    c)   Disadvantages of Zigbee.

    d)   The error sources of GPS to locate position.

    e)   Classes of GPRS devices.

    f)   "Handoff" in cellular telephony system.

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[Total No. of Pages : 2

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S.Y. B.Sc. (Computer Science)
MATHEMATICS (Paper - I)
MTC-241: Computational Geometry
(2019 Pattern) (Semester - IV) (24221)

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

Instructions to the candidates :
1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
2) *Non-programmable scientific calculator is allowed.*

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

a) Find homogenous co-ordinate of point $A = [1, 2]$.

b) If $A(\triangle ABC) = 5$ sq. unit is reflected through $y = x$ line, find Area of transformed object.

c) Find Foreshortening factor f, of the transformation Matrix for Axonometric projection.

$$[T] = \begin{bmatrix} 0.5 & 0.43 & 0 & 0 \\ 0 & 0.86 & 0 & 0 \\ 0.86 & 0.25 & 0 & 0 \\ 0.58 & 0.75 & 0 & 1 \end{bmatrix}$$

d) Find direction cosines of the plane $x + y + z = 0$.

e) Write types of all Axonometric parallel projections.

f) Define projection in three-Dimensional space.

g) Find Initial point of part of circle $x^2 + y^2 = 16$ in second quadrant.

P.T.O.

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

a) Show that 2 × 2 matrix $[T] = \begin{bmatrix} 2t & \dfrac{1}{t} \\ t & \dfrac{1}{t} \end{bmatrix}$

represents pure rotation in two-Dimensional space.

b) If circle $(x-1)^2 + (y+1)^2 = 9$ is transformed by translation in X-direction by 2 and Y-direction by 3 then find centre of transformed circle.

c) Find concatenated transformation matrix for the following sequence of transformation, First shearing in Y-direction proportional to x and z co-ordinate with 1 and 3 units respectively. Followed by Reflection through xz plane (i.e. $y = 0$ plane).

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

e) Develop the bottom view of the line segment AB where A = [0 0 1] and B = [1 0 1].

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

a) Find the parametric equation of Be'zier curve determine by four control points B_0 [0 2], B_1 [2 3] B_2 [3 2] and B_3 [2 0]. Also find position vectors of the point on the curve corresponding to parametric values $t = 0.2, 0.4, 0.6$.

b) i) Generate equispaced 3 points on the circle $x^2 + y^2 = 36$ in second quadrant only.

   ii) Write the transformation matrix for dimetric projection with

   $$f_z = \frac{3}{8}(\theta > 0, \phi > 0).$$

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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) Use north-west corner rule to obtain Initial Basic Feasible Solution of the following transportation problem :

Destination → Origin ↓	D_1	D_2	D_3	Supply
O_1	5	1	8	12
O_2	2	4	0	14
O_3	3	6	7	4
Demand	9	10	11	

b) Write dual form of the following Linear Programming Problem :

Minimize $Z = 10 x_1 + 6x_2 + 2x_3$

Subject to :

$$-x_1 + x_2 + x_3 \geq 1$$
$$3x_1 + x_2 - x_3 \geq 2$$
$$x_1, x_2, x_3 \geq 0$$

P.T.O.

c) Solve following assignment problem for Maximization :

Jobs → Persons ↓	I	II	III
A	1	4	5
B	2	3	3
C	3	1	2

d) What is degeneracy in the transportation problem?

e) Write the mathematical formulation of assignment problem.

f) Write the standard form of 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 :

Maximize $Z = 3x + 2y$

Subject to :

$$x - y \leq 1$$
$$x + y \geq 3$$
$$x, y \geq 0$$

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

a) Obtain Initial Basic Feasible Solution of the following transportation problem by Vogel's approximation method.

Warehouses → Factory ↓	W_1	W_2	W_3	W_4	Supply
F_1	30	25	40	20	100
F_2	29	26	35	40	250
F_3	31	33	37	30	150
Requirement	90	160	200	50	

b) Solve the following assignment problem :

	A	B	C	D	E
M_1	4	6	10	5	6
M_2	7	4	.	5	4
M_3	-	6	9	6	2
M_4	9	3	7	2	3

c) Solve the following linear programming problem by graphically :

Maximize $Z = 3x + 5y$

Subject to :

$$x + 2y \leq 2000$$

$$x + y \leq 1500$$

$$y \leq 600$$

$$x, y \geq 0$$

d) Solve the following Linear Programming Problem by Big-M method.

Maximize $Z = x + 4y$

S.t.

$$x + 2y \leq 2$$

$$4x + 3y \geq 12$$

$$x, y \geq 0$$

e) Solve following assignment problem for minimum cost :

	I	II	III	IV	V
1	3	8	2	10	3
2	8	7	2	9	7
3	6	4	2	7	5
4	8	4	2	3	5
5	9	10	6	9	10

Q3) Attempt any one of the following : $[1 \times 10 = 10]$

a) Obtain optimal solution of the following Transportation Problem by modified distribution method.

1	2	1	4
(20)		(10)	
3	3	2	1
	(20)	(20)	(10)
4	2	5	9
	(20)		

Also obtain alternate optimal solution

b) Solve the following linear programming problem by simplex method :

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to :

$$x_1 + 2x_2 + x_3 \leq 430$$

$$3x_1 + 2x_3 \leq 460$$

$$x_1 + 4x_2 \leq 420$$

$$x_1, x_2, x_3 \geq 0$$

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S.Y. B.Sc./B.C.A.
(Computer Science/Biotech./HS)
ENVIRONMENTAL SCIENCE
AECC - Environmental Awareness
(2019 Pattern) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

1) Question 1 is compulsory.

2) Solve any three questions from Q.2 to Q.5.

3) Questions from 2 to 5 carries equal marks.

Q1) Solve any five of the following : [5]

a) Define the term air pollution?

b) What is meant by solid waste management?

c) What is the main aim of Qyoto protocol?

d) Name two gases that are mainly responsible for acid rain?

e) Which layer of atmosphere contains the ozone layer?

f) Why Environmental Laws are important?

Q2) a) Write causes, effects and control measures for water pollution? [6]

b) How human health risks caused by nuclear hazards. [4]

Q3) a) Discuss the role of Indian and other religions and cultures in Environmental conservation. [6]

b) What are the aims and objectives of Environmental Protection Act? [4]

Q4) a) Describe human wildlife conflicts in Indian context. [6]
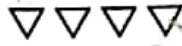
b) Explain chipko movement? [4]

Q5) Write short note on any four of the following : [10]

a) Natural reserved areas

b) Climate change

c) Water (prevention and control of pollution) Act

d) Convention on biological diversity

e) Bishnois of Rajsthan

f) Soil pollution

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S.Y. B.Sc.(Computer Science / Biotechnology)
AECC-II : LANGUAGE COMMUNICATION - II
(2019 Pattern) (Semester - IV) (Paper - I) (24922)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :
1) All the questions are compulsory.
2) Figures to the right indicate full marks.

Q1) Attempt any one of the following in about 150-200 words.   [15]

a) How did the narrator realize that Todd has completely forgotten that he owed the narrator a Dollar?

b) What message do you get by the last stanza of the poem 'Stopping by Woods on a Snowy Evening'?

Q2) Attempt any two of the following in about 50-80 words.   [10]

a) NSS Department of your college has organized Blood Donation Camp. Draft a notice to all the students of your college for inviting them to donate blood.

b) As a secretary of students council, prepare the minutes of the meeting on 'Planning of extra-curricular activities'.

c) Explain the importance of content writing in Blogs and social media sites.

Q3) Attempt any two of the following in about 50-80 words.   [10]

a) Without soft skills, hard skills doesn't have any importance. Discuss.

b) Why it is important to do SWOT analysis before any venture?

c) Explain Project Management.

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