

WALCHAND COLLEGE OF ENGINEERING



(Government Aided Autonomous Institute)

Visharambag, Sangli – 416415



Third Year B.Tech. Information Technology

ESE , ODD SEMESTER, AY 2023-24

Computer Algorithm (6IT303)

ESE

PRN: 21610053

Day & Date: Monday, 04/12/2023 Time : 3.00 pm to 5.00 pm

Max Marks: 50

IMP: Verify that you have received question papers with correct course code, branch etc.

Instructions		a) All questions are compulsory. b) Writing question number on answer book is compulsory otherwise answers may not be assessed. c) Assume suitable data wherever necessary. d) Figures to the right of question text indicate full marks. e) Mobile phones, smart gadgets and programmable calculators are strictly prohibited. f) Except PRN anything else writing on question paper is not allowed. g) Exchange/Sharing of stationery, calculator etc. not allowed. Text on the right of marks indicates course outcomes (Only for faculty use)		Marks
Q1	A)	Give a real life example of insert sort. What is the complexity? Can it be improved further?	4 CO3	
	B)	How will you parallelize the Fractal Image Decoding process? What will be the speedup?	4 CO3	
	C)	List categories of shortest path finding algorithms with suitable examples.	3 CO3	
Q2	A)	What is transitive closure? Write an expression to find transitive closure of the given graph and its complexity. Or Write Johnson's algorithm for APSP.	5 CO2	
	B)	What is Arbitrage? List the solution steps.	5 CO2	
	C)	Define the terms Residual graph and Augmenting path.	3 CO1	
Q3	A)	With a neat diagram write an overlapping suffix lemma.	5 CO3	
	B)	Given the 2D geographical map of India with locations of major cities (with more than 2L population) indicated with their x and y co-ordinates, develop the logic to decide two closest cities in the map. What is the complexity?	5 CO3	
	C)	Find the auxiliary function Π required in the KMP string matching method, which is pre-computed from pattern {a,b,c,a,b,a}.	3 CO2	
Q4	A)	What is an approximate algorithm? Define Polynomial time approximate and Fully polynomial time approximate algorithm.	5 CO1	
	B)	Prove that the Vertex Cover decision algorithm belongs to the class of NPC.	5 CO2	
	C)	Draw a neat diagram to demonstrate relationship between complexity classes of the algorithms with one suitable example of each class.	3 CO1	

.....End of question paper



WALCHAND COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Vishwarambag, Sangli – 416415

Third Year B.Tech. Electronics Engineering

MSE, ODD SEMESTER, AY 2023-24

Open Elective-1 Signals and Systems (6OE358)



MSE

PRN: _____

Day & Date: Wednesday, 27/09/2023

Time : 10.30 am to 12.00 noon

Max Marks: 30

IMP: Verify that you have received question papers with correct course code, branch etc.

- Instructions**
- a) All questions are compulsory.
 - b) Writing question number on answer book is compulsory otherwise answers may not be assessed.
 - c) Assume suitable data wherever necessary.
 - d) Figures to the right of question text indicate full marks.
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Marks

Q1 A) Prove that following system is Shift invariant but non linear

CO1

3

$$y(t) = [x(t)]^2$$

B) Define periodic signal and non periodic signal. Prove that $x(t) = A \cos \Omega_0 t$ is a periodic signal

CO1

2

C) Define Sampling theorem. Find Nyquist rate for the signal

CO1

5

$$x(t) = \frac{1}{2\pi} \cos(4000\pi t) \cos(1000\pi t)$$

Q2 A) Determine Fourier Series representation for the signal given as $x(t) = 5 \cos\left[\frac{\pi}{3}t + \frac{\pi}{6}\right]$

CO2

5

B) State and prove Time Shifting property of Fourier Transform

CO2

5

Q3 A) Find Laplace Transform for the following

CO2

1) $x(t) = \cos(\omega_0 t)u(t)$

6

2) $x(t) = e^{-at}u(t)$

B) State and prove Time scaling property of Laplace Transform

CO2

4

.....End of question paper.....



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(Government Aided Autonomous Institute)

Vishwarambag, Sangli - 416415

Third Year B.Tech. Information Technology

MSE, ODD SEMESTER, AY 2023-24

Computer Algorithms (6IT303)



MSE

PRN: 21610053

Day & Date: Saturday, 23/09/2023

Time: 10.30 am to 12.00 noon

Max Marks: 30

IMP: Verify that you have received question papers with correct course code, branch etc.

Instructions	<ul style="list-style-type: none">a) All questions are compulsory.b) Writing question number on answer book is compulsory otherwise answers may not be assessed.c) Assume suitable data wherever necessary.d) Figures to the right of question text indicate full marks.e) Mobile phones, smart gadgets and programmable calculators are strictly prohibited.f) Except PRN anything else writing on question paper is not allowed.g) Exchange/Sharing of stationery, calculator etc. not allowed.
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		Text on the right of marks indicates course outcomes (Only for faculty use)	
		Marks	
Q1	A)	Write an algorithm for awarding gold, silver and bronze medal for the singles badminton tournament with n players. What is the complexity of the algorithm?	5 CO3
	B)	What is optimal Huffman code for following symbol/frequency list? {A:9,B:12,C:16,D:8,E:20}	3 CO2
	C)	Interpret the asymptotic notation 'theta' with a neat diagram.	2 CO1
Q2	A)	How will you parallelize the Vector Quantization (VQ) technique applicable for compression of an image of size 128*128 with 8*8 block size and code book size of 32?	5 CO2
	B)	List the different parallel computing paradigm with required infrastructure.	3 CO1
	C)	List the functions associated with multi-process communication.	2 CO3
Q3	A)	What is "RELAX". An edge from u to v has a weight 4, u.d=6, v.d=12 and the predecessor vertices x & y for u & v respectively. Draw the edge with the revised values of these parameters after applying a function RELAX on the edge {u,v}.	5 CO2
	B)	What is the complexity of Gift Wrapping (nesting boxes) algorithm for n boxes of d dimension? (Assume suitable data)	3 CO3
	C)	How will you find negative weight cycle in a graph?	2 CO1

.....End of question paper.....



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Vishwarambag, Sangli – 416415

Third Year B.Tech. Information Technology

MSE, ODD SEMESTER, AY 2023-24

Database Engineering (6IT301)



MSE

PRN: _____

Day & Date: Thursday, 21/09/2023

Time: 10.30 am to 12.00 noon

Max Marks: **30**

IMP: Verify that you have received question papers with correct course code, branch etc.

Instructions	<ul style="list-style-type: none"> a) All questions are compulsory. b) Writing question number on answer book is compulsory otherwise answers may not be assessed. c) Assume suitable data wherever necessary. d) Figures to the right of question text indicate full marks. e) Mobile phones, smart gadgets and programmable calculators are strictly prohibited. f) Except PRN anything else writing on question paper is not allowed. g) Exchange/Sharing of stationery, calculator etc. not allowed.
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Q1	<p>A) Consider a relation- R (A , B , C , D , E) with functional dependencies-</p> $A \rightarrow BC$ $CD \rightarrow E$ $B \rightarrow D$ $E \rightarrow A$ <p>Find out all candidate keys.</p>		3 CO1																																																
B)	<p>A relational schema for a train reservation database is given below. Passenger (pid, pname, age) ; Reservation (pid, class, tid);</p> <table border="1"> <tr><td colspan="3">Table: Passenger</td></tr> <tr><td>pid</td><td>pname</td><td>age</td></tr> <tr><td>-----</td><td></td><td></td></tr> <tr><td>0</td><td>Sachin</td><td>65</td></tr> <tr><td>1</td><td>Rahul</td><td>66</td></tr> <tr><td>2</td><td>Sourav</td><td>67</td></tr> <tr><td>3</td><td>Anil</td><td>69</td></tr> </table> <table border="1"> <tr><td colspan="3">Table : Reservation</td></tr> <tr><td>pid</td><td>class</td><td>tid</td></tr> <tr><td>-----</td><td></td><td></td></tr> <tr><td>0</td><td>AC</td><td>8200</td></tr> <tr><td>1</td><td>AC</td><td>8201</td></tr> <tr><td>2</td><td>SC</td><td>8201</td></tr> <tr><td>5</td><td>AC</td><td>8203</td></tr> <tr><td>1</td><td>SC</td><td>8204</td></tr> <tr><td>3</td><td>AC</td><td>8202</td></tr> </table>	Table: Passenger			pid	pname	age	-----			0	Sachin	65	1	Rahul	66	2	Sourav	67	3	Anil	69	Table : Reservation			pid	class	tid	-----			0	AC	8200	1	AC	8201	2	SC	8201	5	AC	8203	1	SC	8204	3	AC	8202	<pre> SELECT pid FROM Reservation , WHERE class 'AC' AND EXISTS (SELECT * FROM Passenger WHERE age > 65 AND Passenger.pid = Reservation.pid) </pre>	4 CO2
Table: Passenger																																																			
pid	pname	age																																																	

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1	SC	8204																																																	
3	AC	8202																																																	
C)	<p>i. What pids are returned by the following SQL query for the above instance of the tables?</p> <p>ii. Differentiate between Where & Having Clause in SQL.</p> <p>R (A, C, D, E, H) set of attribute having two function F & G with some set of attributes F: A ---> C, AC ---> D, E ---> AD, E ---> H G: A ---> CD, E ---> AH Is F & G are equivalent? Validate your answer with proof</p>		5 CO1																																																

Q2	A)	<p>Let $R(A,B,C,D,E,P,G)$ be a relational schema in which the following FDs are known to hold:</p> <p>$AB \rightarrow CD$ $DE \rightarrow P$ $C \rightarrow E$ $P \rightarrow C$ $B \rightarrow G$</p> <p>Convert the relation to BCNF.</p>	5	CO2
	B)	<p>A table has fields F1, F2, F3, F4, and F5, with the following functional dependencies:</p> <p>$F1 \rightarrow F3$ $F2 \rightarrow F4$ $(F1, F2) \rightarrow F5$</p> <p>Identify the current normalization form of table. Justify your answer for given normal form in FDs</p>		
	C)	<pre> erDiagram { entity A { attribute a1 attribute a2 } entity B { attribute b1 attribute b2 } A }o--o{ B : R } </pre>		
Q3	A)	Comment on: "Every relation in BCNF is also in 3NF"	2	CO3
	B)	<p>The following functional dependencies hold true for the relational scheme $R(W, X, Y, Z)$ -</p> <p>$X \rightarrow W$ $WZ \rightarrow XY$ $Y \rightarrow WXZ$</p> <p>Write the irreducible equivalent set for given set of functional dependencies</p>		
		<i>.....End of question paper.....</i>		



WALCHAND COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Visharambag, Sangli - 416415



Third Year B.Tech. Information Technology

MSE, ODD SEMESTER, AY 2023-24

PE-1 Graph Theory (6IT311)

MSE

PRN: 21610053

Day & Date: Monday, 25/09/2023 Time : 10.30 am to 12.30 pm

Max Marks: **30**

IMP: Verify that you have received question papers with correct course code, branch etc.

- Instructio**n
- a) All questions are compulsory.
 - b) Writing question number on answer book is compulsory otherwise answers may not be assessed.
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Marks

CO1

Q1 A) Solve Following:

- i) For a connected planar simple graph $G=(V, E)$ with $e=|E|=16$ and $v=|V|=9$
- Mention appropriate relationship in the planar graph to calculate number of regions.
 - The number of regions graph $G = \underline{\hspace{2cm}}$

6

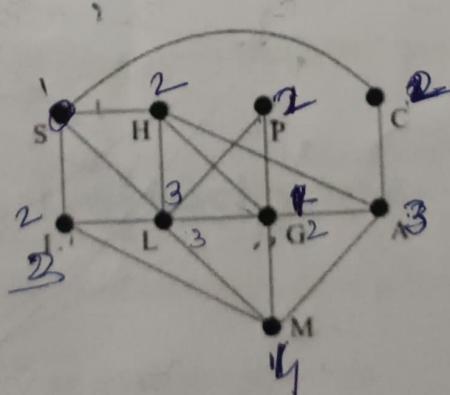
- ii) Draw any undirected complete graph K_4

- Mention appropriate relationship in between number of vertices and edges in K_n
- The total number of edges in a complete undirected graph, $K_4 = \underline{\hspace{2cm}}$

CO3

B) What is the Chromatic Index (Vertex Coloring) of the following Graph?

Explain necessary process to obtain chromatic Index of a graph.



$$\frac{n}{n-\delta(u)} \leq \chi(u) \leq 1 + \Delta$$

$$\frac{9}{9-2} \leq \chi(u) \leq 1 + 6$$

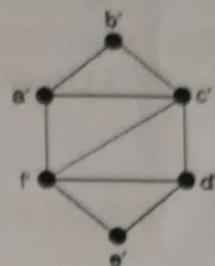
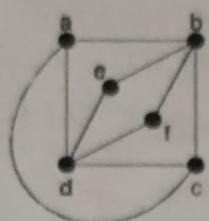
$$2 \leq \chi(u) \leq 7$$

Q2 A) If following graphs are isomorphic to each other?

CO3

- Justify your answer with necessary reasons.

- What are the necessary and sufficient conditions to check graph isomorphism?



6

B) Draw $K_{3,4}$ Graph.

CO1

The chromatic number i.e. minimum number of colors required for edge coloring
in $K_{3,4} = \underline{\hspace{2cm}}$

4

Q3 A) Using suitable example, explain following (Any Two)

CO2

i) Handshaking theorem in graph theory

- Comment on theorem, equation and application

ii) Graph representation in an Adjacency Matrix

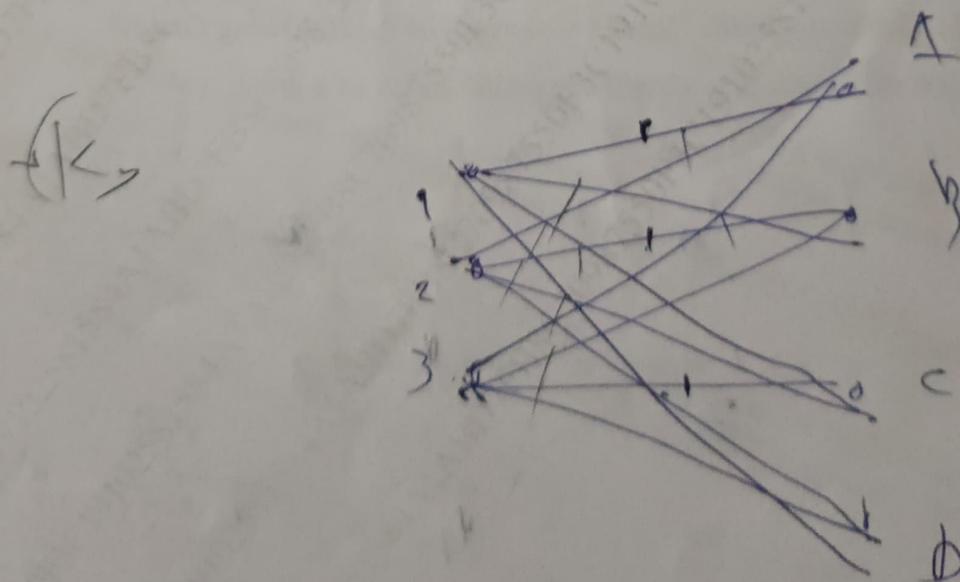
- Comment on Matrix size, diagonal entries, loop representation,
matrix elements, application

10

iii) Graph Connectivity

- Comment on graph Connectedness, Graph Components Rank and Nullity

.....End of question paper



A

B

C

D



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Third Year B.Tech. Information Technology

MSE, ODD SEMESTER, AY 2023-24

Operating System (6IT302)



MSE

PRN: 21010053

Day & Date: Friday, 22/09/2023

Time : 10.30 am to 12.00 noon

Max Marks:

30

IMP: Verify that you have received question papers with correct course code, branch etc.

Instructions a) All questions are compulsory.

- b) Writing question number on answer book is compulsory otherwise answers may not be assessed.
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Marks

- | | | | |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-----|
| Q1 | A) Write short notes on File management, Process management and Memory management. | 5 | CO1 |
| | B) Describe all Operating System Services with neat diagram | 5 | CO1 |
| Q2 | A) A uniprocessor computer system has three processes, which alternate 20ms CPU bursts with 80ms I/O bursts. All the processes were created at nearly the same time. The I/O of all the processes can proceed in parallel. What will be the CPU utilization (over a long period of time) using FCFS and Round Robin (time quantum 10ms) for this system? –Draw Gantt chart | 4 | CO2 |
| | B) Compare Priority based and Rate monolithic Scheduling algorithms with respect to CPU utilization, Throughput, Turnaround time, Waiting time and Response time. | 4 | CO2 |
| | C) Define following terms: Multiprocessor Scheduling; Real time Scheduling. | 2 | CO2 |
| Q3 | A) Define Race condition and Critical section. Compare critical section software solutions with each other with following criteria: Mutual Exclusion, Progress and Bounded Waiting time. | 5 | CO2 |
| | B) Elaborate on the utilization//usage of semaphore, along with an implementation code. | 5 | CO2 |

.....End of question paper



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Third Year B.Tech. Electronics Engineering

ESE , ODD SEMESTER, AY 2023-24

Open Elective-1 Signals and Systems (6OE358)



ESE

PRN: 21610053

Day & Date: Tuesday, 28/11/2023 Time: 3.00 pm to 5.00 pm

Max Marks: 50

IMP: Verify that you have received question papers with correct course code, branch etc.

Instruction ns a) All questions are compulsory.

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Marks

Q1 A) Explain the following types of signals

1. Continuous time and Discrete time
2. Periodic and Non periodic
3. Symmetric and Anti symmetric
4. Causal and Non causal
5. Energy signal and Power Signal

5 CO1

B) Determine the range of values of 'a' and 'b' for stability of LTI system with impulse response $h(n) = b^n ; n < 0$ and $h(n) = a^n ; n \geq 0$

5 CO1

Q2 A) Find Fourier transform of Rectangular pulse

5 CO2

B) Find DTFT of signal $x(n) = a^{|n|} ; |a| < 1$

5 CO2

Q3 A) Explain how stability of system can be determined using Laplace Transform? Using Laplace Transform find out whether system with impulse response $h(t) = e^{-t} u(t)$ is stable or not stable.

5 CO2

B) The impulse response of certain system is $h(t) = e^{-5t} u(t)$. Find output response of the system for input $x(t) = e^{-2t} u(t)$ [Use graphical convolution method]

5 CO3

Q4 A) Find Z transform of $x(n) = a^n u(n) + b^n u(-n-1)$. Sketch the ROCs considering

5 CO3

1) $b < a$

2) $a < b$

- B) Find inverse Z transform using Residue method

$$X[z] = \frac{z^2 + z}{(z - 1)^2} \quad \text{Right sided sequence}$$

5 CO4

- Q5 A) Write note on Applications of Signals and Systems in various fields

5 CO4

- B) Write a single MATLAB program which will generate following plots in a single plot

- 1) Sine wave signal
- 2) Cosine wave signal
- 3) Unit step signal
- 4) Ramp Signal
- 5) Exponential Signal

5 CO4

.....End of question paper



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(Government Aided Autonomous Institute)
Visharambag, Sangli – 416415
Third Year B.Tech. Information Technology
ESE , ODD SEMESTER, AY 2023-24
Database Engineering (6IT301)



ESE

Day & Date: Thursday, 30/11/2023

Time: 3.00 pm to 5.00 pm

Max Marks: **50**

PRN: 21610053

- IMP:** Verify that you have received question papers with correct course code, branch etc.
- Instructions**
- a) All questions are compulsory.
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- | | | |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Q1 | A) Given R (A, B, C, D, E) with the set of FDs,
$F = \{AB \rightarrow CD, ABC \rightarrow E, C \rightarrow A\}$
(i) Find any two candidate keys of R.
(ii) What is the normal form of R? Justify. | Marks
CO1
4 |
| B) | Consider the employee database schema given below,
employee (employee name, street, city)
works (employee name, company name, salary)
company (company name, city)
manages (employee name, manager name)
Give an SQL DDL definition for 'works'. Identify referential-integrity constraints that should hold, and include them in the DDL definition. | CO2
4 |
| C) | Refer the schema given in 1 B and answer SQL query for the following.
i. Find the names and cities of residence of all employees who work for 'TCS' company.

ii. Display the names of companies with average salary if average salary is greater than 50000

iii. Display all the manager names with their company name and salary. | CO2
6 |

- | | | |
|-----------|-----------------------------------------------------------------------------------|----------|
| Q2 | A) Write a short note on following indexing techniques: (2 Marks for each) | CO1
8 |
| i. | Ordered indices | |
| ii. | Sparse index | |
| iii. | Dense index | |
| iv. | Bitmap index | |

- B)** Answer the following for a B^* tree of order 4. CO1
- Range (min & max) of number of children root can have
 - Range of number of children any non-leaf node other than root can have
 - Range of number of values that leaf can hold
 - Construct the B^* tree of order 4, for the given search-key values: 2, 3, 5, 7, 11, 17, 19, 23, 29, 31 being inserted in mentioned order. 5

- Q3 A)** What is serializable schedule? What is conflict serializable schedule? Convert the following schedule into concurrent conflict serializable schedule. CO3

T_1	T_2
read(A) write(A) read(B) write(B)	read(A) write(A) read(B) write(B)

5

- B)** Consider the following two transactions: CO3

T_{31} : read(A);
read(B);
if $A = 0$ then $B := B + 1$;
write(B).

4

T_{32} : read(B);
read(A);
if $B = 0$ then $A := A + 1$;
write(A).

Add lock and unlock instructions to transactions T_{31} and T_{32} , so that they observe the two-phase locking protocol. Can the execution of these transactions result in a deadlock?

- C)** What is wait-die and wound-wait strategy for deadlock prevention? 3 CO3

- Q4 A)** How checkpoint is used for recovery? Consider the following set of operations in the log. If a crash happens and the system tries to recover using both undo and redo operations, what are the contents of the undo list and the redo list? CO3

(start, T4); (write, T4, y, 2, 3); (start, T1); (commit, T4); (write, T1, z, 5, 7);
(checkpoint);
(start, T2); (write, T2, x, 1, 9); (commit, T2); (start, T3); (write, T3, z, 7, 2);

5

- B)** Compare the deferred- and immediate-modification versions of the log-based in terms of ease of implementation and overhead cost. 3 CO3

- C)** What recovery actions should be taken for the following log record? CO3

<T1 start>
<T1, A, 5000, 4000>
<T1, B, 6000, 7000>
<T1 commit>
<T2, C, 1500, 1000>

3

..... End of question paper



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Visharambag, Sangli - 416415

Third Year B.Tech. Information Technology

ESE, ODD SEMESTER, AY 2023-24

Graph Theory (6IT311)



ESE

PRN: _____

Day & Date: Wednesday, 06/12/2023

Time : 3.00 pm to 5.00 pm

Max Marks: **50**

IMP: Verify that you have received question papers with correct course code, branch etc.

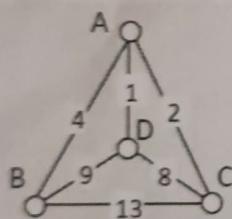
- Instructions**
- a) All questions are compulsory.
 - b) Writing question number on answer book is compulsory otherwise answers may not be assessed.
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Marks

Q1 A) An undirected graph is given with vertex set = {A, B, C, D} along with edge weights.

CO3



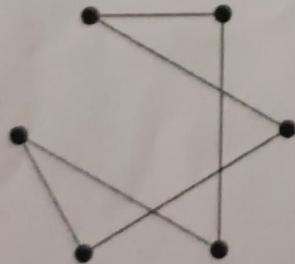
i) As per Brute force algorithm, the total number of different Hamiltonian circuits that start with node A and end with the same node A are = _____

5

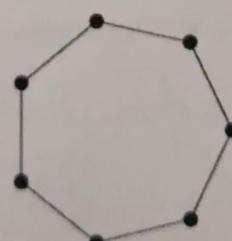
ii) The minimum cost Hamiltonian circuit that starts with node A and ends with the same node A is A _____ A with cost weight = _____

CO1

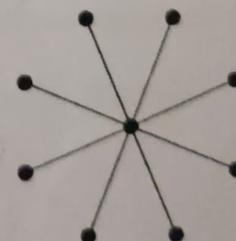
B) Three graphs (G1, G2 and G3) are given as following:



G1



G2



G3

5

i) Which of the graphs in the list of (G1, G2 and G3) are bipartite graphs?

ii) Label the vertices for each of the bipartite graphs in two vertex sets.

(e.g. label A for all vertices in one partition and label B in the other partition)

Q2 A) Consider 11 vertex graph representing a polyhedron containing 12 faces. Out of 12 faces 7 are triangles and 4 are quadrilaterals. Considering each triangle face with 3 sides and each quadrilateral face with 4 sides; the last 12th face is to be formed with X number of sides.

CO3

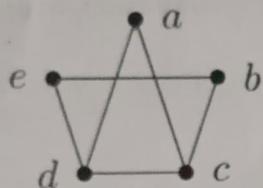
5

Find X = _____ ? Justify the answer with necessary calculation.

B) • Graph 1: $V = \{a, b, c, d, e\}$, $E = \{\{a, b\}, \{a, c\}, \{a, e\}, \{b, d\}, \{b, e\}, \{c, d\}\}$.

CO1

• Graph 2:



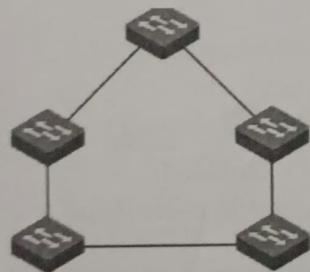
5

If Graph 1 and 2 are isomorphic?

If they are isomorphic, give the isomorphism. If not, explain.

Q3 A) Observe the following LAN (network) as a Graph.

CO2



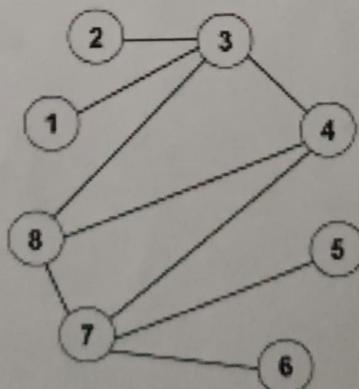
- Identify the problem in above network w.r.t link.
- Which protocol needs to apply to solve the problem in above LAN
- Draw the correct design of a LAN

5

B) Define *Matching Number*.

Find out maximum matching set for following graph.

CO3

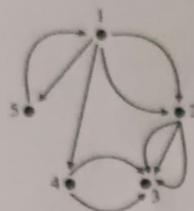


5

Q4 A) The directed Graph is indicated in the adjutancy matrix A. Where, matrix row represents source nodes and matrix column represents sink nodes.

CO1

If A^m represents adjutancy matrix with walk size = m ; i.e. distance in between pair of source and sink then complete the following matrices A^2 and A^3 for all remaining entries.



From	To	1	2	3	4	5
1		0	2	0	1	1
2		0	0	3	0	0
3		0	0	0	0	0
4		0	0	2	0	0
5		1	0	0	0	0

5

The number of walks of length 2 from vertex 1 to vertex 3 = _____

$$A^2 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} \quad A^3 = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

B) Consider the graph M with 3 vertices. Its adjacency matrix is given.

CO3

The total number of distinct 'Minimum Spanning Trees' in graph M; where each of Spanning Tree costs 2 = _____

5

$$M = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

Q5 A) Answer following: (Any Two)

CO2

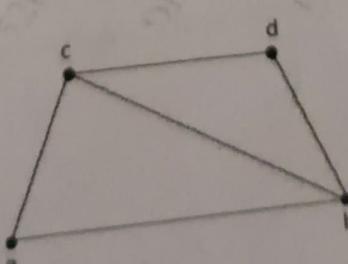
i) Using suitable example, explain Travelling Salesman Problem.

- Comment on Problem statement, possible solution and NP complexity

ii) Describe Planarity of K4, K5 and Q3 graphs
- Comment each Graph if planar? Give its equivalent planar representations.

10

iii) Define *Line Covering*. Find out line covering sets for following graph.



.....End of question paper

WALCHAND COLLEGE OF ENGINEERING



(Government Aided Autonomous Institute)

Visharambag, Sangli – 416415

Third Year B.Tech. Information Technology

ESE , ODD SEMESTER, AY 2023-24

Operating System (6IT302)



ESE

PRN: 21610053

Day & Date: Saturday, 02/12/2023 Time : 3.00 pm to 5.00 pm

Max Marks:

50

IMP: Verify that you have received question papers with correct course code, branch etc.

Instructions a) All questions are compulsory.

- b) Writing question number on answer book is compulsory otherwise answers may not be assessed.
- c) Assume suitable data wherever necessary.
- d) Figures to the right of question text indicate full marks.
- e) Mobile phones, smart gadgets and programmable calculators are strictly prohibited.
- f) Except PRN anything else writing on question paper is not allowed.
- g) Exchange/Sharing of stationery, calculator etc. not allowed.

Text on the right of marks indicates course outcomes (Only for faculty use)

Marks

Q1 A) Consider the following set of processes, with the length of the CPU burst time given in milliseconds: **Process** **Burst Time** **Priority**

CO2

P1	2	2
P2	1	1
P3	8	4
P4	4	2
P5	5	3

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, non-preemptive priority (a larger priority number implies a higher priority), and RR (quantum = 2). Start time 0.

B) Write a short note on:

CO1

1. Process state diagram
2. IPC
3. Types of System Calls

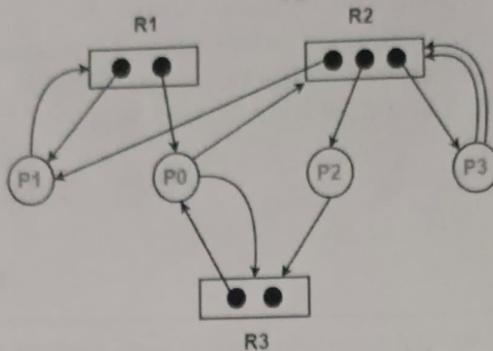
6

Q2 A) Differentiate between deadlock detection and deadlock avoidance method.

5

CO3

- B) Consider the resource allocation graph in the figure below. Find if the system is in a deadlock state otherwise find a safe sequence.



CO3

4

CO3

- C) Consider a system that contains five processes P1, P2, P3, P4, P5 and the 3 resource types A, B and C. Following are the resources types: A has 10, B has 5 and the resource type C has 7 instances.

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P1	0	1	0	7	5	3	3	3	2
P2	2	0	0	3	2	2			
P3	3	0	2	9	0	2			
P4	2	1	1	2	2	2			
P5	0	0	2	4	3	3			

6

Answer the following questions using the banker's algorithm:

- What is the reference of the need matrix?
- Determine if the system is safe or not and find out the safe sequence.
- What will happen if the resource request (1, 0, 0) for process P1 can the system accept this request immediately?

- Q3 A) Describe the Swapping technique. Explain swapping with paging.

3 CO3

- B) Consider the following page reference string:

CO3

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

How many page faults would occur for the following replacement algorithms, assuming one, two, three, four, five, six, and seven frames? Remember that all frames are initially empty, so your first unique pages will cost one fault each.

6

- LRU replacement • FIFO replacement • Optimal replacement

- C) A certain page table entry in the page table of a process has the valid bit set but the present bit unset. Label what happens on a memory access to a virtual address belonging to this page table entry.

CO3

2

- What happens at the TLB? (hit/miss/cannot say)
- Will a page fault occur? (yes/no/cannot say)

- D) Describe the concept of multilevel and hashed paging using diagram. What are the pros and cons of both techniques?

CO3

4

Q4 A) Define the following terms (any 2):

1. File mounting
2. File sharing and protection
3. File operations
4. Directory structure

B) List down all three types of file system allocation methods and explain each one in brief.

CO2

4

CO2

6

.....End of question paper.....