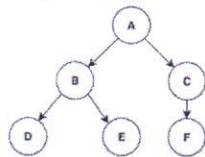


(Time: 3 Hours)

Total Marks 80

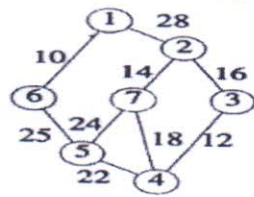
- N.B.** (1) Question 1 is compulsory  
(2) Attempt any 3 from the from remaining 5 question  
(3) Use of Scientific calculator is not allowed.  
(4) Figures to right indicate full marks.

- Q.1** (a) Write an algorithm of binary search. For the following elements search 39 (10)  
using binary search. Also trace the steps. 16 25 39 71 79 80 92  
110 126 155  
(b) What is graph? Explain Graph storage structure. Perform depth first (10)  
search(DFS) for following graph



- Q.2** (a) A binary tree has 10 nodes. The inorder and preorder traversal are shown (10)  
below.  
Inorder: A B C E D F J G I H  
Preorder: J C B A D E F I G H  
Show a step-wise reconstruction of the binary tree along with its postorder traversal.  
(b) What is Linear Queue? Write an algorithm for insert and delete element in (10)  
linear queue.
- Q.3** (a) Using modulo division and linear probe method hash the following keys in (10)  
an array of 13 elements. How many collisions occurred and what is  
density of list after the keys are inserted. 846, 780, 431, 28, 87, 613,  
876, 34, 82  
(b) Explain the stack data structure with example. Give algorithm for push, (10)  
pop, stackfull and stack empty functions
- Q.4** (a) Explain the concept of sorting. Sort the following set of elements using (10)  
Quick Sort  
44, 78, 22, 7, 98, 56, 34, 2, 38, 35, 45  
(b) What is analysis of an algorithm? Explain the asymptotic notations (Big (10)  
O, Omega and Theta) used while analysis of an algorithm.
- Q.5** (a) What is Heap tree? Create an Max Heap for following data (10)  
29, 8, 27, 99, 19, 32, 51, 4 Also perform one deletion.  
(b) Create B tree of order 3 with Create B tree of order 3 with 13, 34, 30 (10)  
23, 67, 29, 27, 100, 76, 38, 10

- Q.6 (a) Define minimum spanning tree. Find minimum spanning path & cost for following graph using kruskal algorithm (10)



- (b) What is linked list write an algorithm for (10)
- Insert an element in singly linked list
  - Display the number of elements in singly linked list

-----X-----

(3 Hours)

Total Marks: 80

- N.B.: (1) Q.1 is compulsory.  
(2) Attempt any three out of remaining five.  
(3) Figures to the right indicate full marks.

Q 1A) Consider the following snapshot:

[10]

Processes	Allocation			Max			Available		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
P0	0	1	0	7	5	3	3	3	2
P1	0	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

Using Banker's algorithm

- What is the context of matrix need?
- Is the system in safe state? Give the sequence.

Consider the request from process P1 arrives for (1,0,2). Can the request be immediately granted?

B) What is Operating System? Write the functions of Operating System. What are the different types of Operating System?

[10]

Q 2 A) What is Thread? Explain various kinds of threads in detail.

[10]

B) What do you mean by concurrency control? Explain the use of semaphore and monitors in concurrency control with example.

[10]

Q 3A) Given a reference string to the following pages by a program

[10]

2,1,3,3,2,8,7,8,1,2,3,1,4,1,5,6,2,6,3,5,6,7,8,7,8,3,5,3,8,4,4,3,4. How many page faults will occur for the following page replacement algorithms, assuming three frames?

- LRU replacement
- FIFO replacement
- Optimal replacement

B) Explain the different file allocation methods.

[10]

Q 4A) Suppose a disk drive has 200 cylinders, numbered 0 to 199. The driver is currently serving request at cylinder 100 and previous request was a cylinder 150. The queue is pending request in FIFO order is :-  
27,129,110,186,147,41,10,64,120

[10]

What is the total head movement under following scheduling algorithm?

(i) FCFS (ii) SSTF (iii) SCAN (iv) C-SCAN

Q 4 B) What is a scheduler? Explain the primary objective of scheduling. How many types of scheduler coexist in an Operating System? Explain it with the help of diagram.

[10]

Q 5A) What is dynamic and fixed partition? What are the problems with them and how can we solve these problems? Explain with suitable example.

[10]

B) For the processes listed below the table, draw Gantt chart and calculate average waiting time and average turnaround time using :- [10]

- FCFS (first come first serve)
- SJF (Shortest Job First) in both condition pre-emptive and non-pre-emptive
- Round – robin (Quantum = 2)

Processes	Arrival time(ms)	Burst time(ms)
P1	0	9
P2	1	5
P3	2	7
P4	3	3

Q 6A) Write short notes on: (Any Four) [20]

- Buffering and Spooling
- Process Control Block
- Clock Hardware and clock software
- Linker and Loader
- Swap-space management

(Time: 3 Hours)

[Total Marks: 80]

- N.B: 1) Question No. 1 is compulsory  
 2) Attempt any three questions from remaining five questions  
 3) Illustrate answers with sketches wherever required and use of pencil should be done for drawing sketches

- 1 (a). What is traffic shaping? Explain the techniques used for traffic shaping? [10]  
 (b). i). Find the range of the addresses in the following blocks  
           140.179.220.200/19    subnet mask = 255.255.224.0 [5]  
 ii) What is the netid and subnetid of the address 130.45.34.56 with mask 255.255.240.0 [5]
- 2 (a). Explain guided media in detail [10]  
 (b). Define optimality principle. Explain Link State routing algorithm in detail. [10]
- 3 (a). What are connecting devices? Explain various connecting devices used at various layers of Communication model. [10]  
 (b). Explain HTTP and SMTP protocols used at the application layer? [10]
- 4 (a). i) Assume that signal-to-noise ratio,  $SNR_{dB} = 36$  and the channel bandwidth is 2 MHz. Calculate the theoretical channel capacity. [5]  
 ii) Differentiate between RIP and BGP [5]  
 (b). Explain different types of network topology [10]
- 5 (a). A bit stream 1010101010 is transmitted using the standard CRC method. The generator 10001. If the last bit of data is inverted during transmission as 0 to 1, Is this error detected at the receiver end? [10]  
 (b). Explain IEEE 802.5 standard [10]
6. Write short notes on any four [20]
  - a. TCP connection establishment
  - b. NAT
  - c. Queue management algorithms in routers
  - d. Go Back N-ARQ
  - e. Transmission impairments

- Case Based

(3 Hours)

Total Marks: 80

- N.B.** (1) Question No. 1 is compulsory.  
 (2) Attempt any Three from the remaining Five questions.  
 (3) Answers to questions should be grouped and written together.

- A** From the following trial balance prepare Trading and Profit and loss account for the year ended 31st March 2018 and also prepare balance sheet as on date for HMH & Bros. [10]

Particulars	Dr(Amt Rs.)	Cr(Amt Rs.)
Purchase and purchase return	550000	5000
Sundry debtors and Creditors	4000	4000
Wages	5000	
Salaries	21000	
Sales Returns and Sales	5000	950000
Commission received		5000
Freehold Premises	40000	
Professional Charges	1000	
Discount allowed and received	10000	5000
Bills Receivables and Bills Payables	50000	20000
Drawings	50000	
Capital		200000
Interest on Deposits		1000
Bank balance	100000	
Rent Rates and Insurance	9000	
Office Furniture	6000	
Printing, Stationery & advertising	4000	
Cash in hand	247000	
Income Tax	9000	
Machinery	25000	
Trade expenses	29000	
Stock as on 1st April 2017	25000	
<b>Total</b>	<b>1190000</b>	<b>1190000</b>

**Adjustments:**

1. Closing Stock as on 31st March 2018 Rs. 2000/-
- B** Explain Golden Rule of accounting with example. [10]
- A** Journalise following transactions in the book of Hem & Sons [10]
- 1st July : Started business with cash rs. 50,000  
 2nd July : Purchased goods for cash 40,000  
 3rd July : Sold goods worth rs. 9,000 and received cheque from Ms. Ada  
 4th July : Sold goods worth rs. 60,000  
 5th July : Taken rs. 5,000 as a loan from Mr. Hita  
 6th July : Purchased machinery worth 10,000  
 7th July : Sold goods worth rs. 10,000 with cash discount of 10% on it  
 8th July : Withdraw cash 1,000 from bank for office use.  
 9th July : Cheque received on 3rd July worth rs.9,000 was dishonored  
 10th July : Mr. Rajappa exchanged rs. 5,000 with us as a change.
- B** Explain importance of Trial balance with its basic five entries on Debit and five on Credit balance. [10]

- Q.3 A. Based on the following data prepare cash budget for April to June 2018

[10]

Particulars	April' 18	May' 18	June' 18
Sales	1,00,000	60,000	10,000
Expenses	4,000	6,000	9,000
Bank Interest(Investment)	6,000	8,000	10,000
Workers Salary	1,000	1,000	1,000

- Opening balance for April is expected to be 80,000
- Expenses are delayed by one month.
- Wages are delayed by two month.
- All sales are cash sales.

- B. Explain Cost-Volume-Profit and Break Even Analysis. Also explain "Break even", "Margin of Safety" and "Target Profit" terms.

[10]

- Q.4 A. From the following information calculate **Current Ratio, Liquid Ratio, Creditors Turnover and Average Credit Sales(Month)** of Veena Ltd. and Heena Ltd. **Credit to Debtors is 3 months for Veena Ltd. as well as Heena Ltd.**

[10]

Particulars	Veena Ltd.(Rs.)	Heena Ltd.(Rs.)
Stock	4,00,000	50,000
Debtors	85,000	70,000
Cash	15,000	30,000
Trade Creditors	1,40,000	75,000
Bills Payable	10,000	5,000
Bank Overdraft	20,000	15,000
Creditor for Expenses	30,000	5,000
Total Purchases	4,65,000	3,30,000
Cash Purchases	15,000	10,000

- B. Explain merits & demerits of Accounting Rate of Return(ARR) in Capital Budgeting.

[10]

- A. Given the following information in respect of the Three Machine proposals, rank them (based on most profitable investment) by applying the criteria of **Payback back method**. All sales are on cash. Corporate income tax rate is 40%. Interest on Capital is 10%. [10]

	Machines		
	1	2	3
	Rs.	Rs.	Rs.
Initial investment required estimated annual	3,00,000	3,00,000	3,00,000
Sales	5,00,000	4,00,000	4,50,000
<b><u>Cost of Production: (Estimated)</u></b>			
Direct Materials	40,000	50,000	48,000
Direct Labour	50,000	30,000	36,000
Factory Overheads	60,000	50,000	58,000
Administration Costs	20,000	10,000	15,000
Selling & Distribution Costs	10,000	10,000	10,000

The economic life of machine 1 is 2yrs, while it is 3 yrs for the other two. The scrap values are Rs. 40,000, Rs. 25,000 and Rs. 30,000 respectively.

- B. Difference between Cash Flow and Fund Flow Statement [10]

- A. What is Capital Gearing? Explain Gearing Ratio. [10]

- B. Explain all Five terms. [10]

- Trade Expenses
- Discounts
- Freight
- Goods return
- Workers wages

\*\*\*\*\*

(3 Hours)

Total Marks: - 80

N.B.

1. Question no.1 is compulsory.
2. Attempt any three questions from the remaining five questions.
3. Figures to the right indicate full marks

- 1 (a) Let Set  $A = \{2, 3, 4, 5, 6, 30, 60\}$  and the partial order relation  $R$  is the divides relation on set  $A$ . i.e.  $a|b$   $aRb$  iff ( $a$  divides  $b$ ) (10)

- Draw the digraph of  $R$
- Draw the Hasse diagram for the poset( $A, R$ )
- Find the minimal elements, maximal elements, least & greatest element, if it exists

- (b) Prove that  $[p \rightarrow (q \rightarrow r)] \rightarrow [(p \rightarrow q) \rightarrow (p \rightarrow r)]$  is a tautology (5)

- (c) Explain Time Changing Environment in Decision Making (5)

- 2 (a) There are three alternatives  $A_1, A_2, A_3$  and there are four criteria  $C_1, C_2, C_3, C_4$ . The comparison matrix for pair wise criteria is given below (10)

	$C_1$	$C_2$	$C_3$	$C_4$
$A_1$	15	12	20	10
$A_2$	11	19	14	35
$A_3$	10	20	13	11

The weights for criteria  $C_1, C_2, C_3, C_4$  are 0.2, 0.15, 0.4, 0.25, respectively. Find the best alternative using Weighted Product Model (WPM).

- 2 (b) Use Mathematical Induction to prove the property  $P(n)$  (10)

- $P(n): n < 2^n \forall n \in \mathbb{N}$
- $P(n): 3n + 2$  is an odd number then  $n$  is odd, where  $n$  is a natural number

- 3 (a) Find the weights for each criteria using Entropy/Shannon Theory (10)

	$C_1$	$C_2$	$C_3$	$C_4$
$A_1$	25	20	15	30
$A_2$	10	30	20	30
$A_3$	30	10	30	10

- (b) A pair of dice are rolled. If a sum of 7 is obtained then the person wins, else the person loses. If costs Rs 1 to play the game. If the person wins he gets his 1 rupee back and gets an additional 5 rupees. Otherwise, the person loses 1 rupee. If the bet is placed 100 times, how much is the person expected to lose or win? (10)

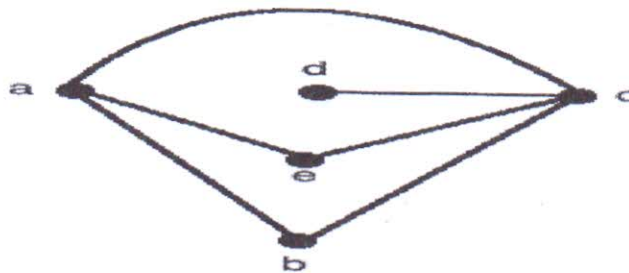
- 4 (a) Obtain a recurrence relation for Tower of Hanoi problem. There are  $n$  rings resting on peg A. The rings are to be transferred to peg B. No ring of a larger size is allowed to be kept on a ring of smaller size. How many moves are required? Peg C is available for temporary storage. (10)

- 4 (b) Are the following statements valid? (10)

- If I try hard and I have talent then I will become a musician.
  - If I become a musician then I will be happy.
- Therefore, I will not be happy then either I did not try hard or I do not have talent.

- 5 (a) Find the homogenous solution of the recurrence relation  
 $a_n = 6a_{n-1} - 11a_{n-2} + 6a_{n-3}$  with boundary conditions  $a_0 = 2, a_1 = 5, a_2 = 15$  (10)

- (b) Find the adjacency list, adjacency matrix, Euler path and Euler circuit for the following graph (10)



- 6 (a) Find the particular solution of the following recurrence relation:  
 $a_n + 5a_{n-1} + 6a_{n-2} = 42 \times 4^n$  (10)

- (b) Determine if the relation  $R$  on set  $A$  is reflexive, irreflexive, symmetric, asymmetric, antisymmetric and transitive.  $A =$  set of real numbers and  $aRb$  iff  $|a - b| = 2$  (10)

\*\*\*\*\*