EX/IEBT/IT/T/225/2018

BACHELOR OF TECHNOLOGY (I.E.E) EXAMINATION

2ND YEAR, 2ND SEMESTER Examination, 2018

COMPUTER ORGANIZATION & NETWORKING

Time: 3 hours **Full Marks: 100**

Answer 1 question from each group

Group-I (CO1)

1. a) What do you mean by internal fragmentation? Consider a process with size 72,766 bytes and each page in logical memory having size 2,048 bytes. How many pages need to be allocated to the process for its successful execution? Hence calculate the amount of internal fragmented memory.

b) Consider a swapping system in which the main memory consists of the following hole sizes in the order specified as given: 14K, 12K, 8K, 10K, 19K, 12K, 7K and 15K. Show how these holes will be allocated for the successive memory requests of processes of size 8K, 11K, 19K, 13K and 6K using first fit, best fit and worst fit algorithms. Hence calculate the amount of wasted memory for each of the 3 allocation algorithms. Show separately with the help of diagrams.

c) What do you mean by TLB Reach? Consider a memory system having 4GB virtual address space. Each page size is 4KB. A TLB is used with a total of 2K page table entries. Calculate TLB reach in Megabytes.

[(2+2+2)+(3+3+3)+(1+4)=20]

Or,

2. a) What is the drawback of conventional page table? How inverted page table overcomes this? Use diagrams.

b) Suppose in a paging system, each page in the logical memory is of size 1KB. The size of the logical and physical address space are of sizes 64 MB and 512MB respectively. Calculate the number of entries in the conventional and in the inverted page tables. If 1 extra valid/invalid bit is stored in the conventional page table for the purpose of memory protection, calculate the amount of memory (in MB) needed to store the conventional page table in the memory.

c) Suppose in a segmented memory system, there are 128 segments each of size 2KB. Find the size of the virtual address space in MB.

d) Consider the following segment table with the base addresses and the lengths of segments as given below:

Segment	Base	Length
0	369	600
1	3420	14
2	190	100
3	1320	580
4	195	96

Calculate the physical addresses for each of the following logical addresses divided into segment number and segment offset.

i. 0,430 ii. 1,20 iii. 3,250 iv. 2, 200 v. 4, 95

[(2+3)+(2+2+3)+3+5=20]

Group- II (CO2)

3. a) Consider the following set of processes with the Burst time and Arrival time as given in milliseconds.

Process	Arrival time	Burst time	Priority
P1	0	10	4
P2	0	3	1
P3	3	8	2
P4	4	16	3
P5	7	2	5

Calculate the average waiting time of all the processes using priority scheduling algorithm separately with and without pre-emption.

b) Suppose a disk has 300 tracks numbered from 0 to 299. If the read/write head of the disk is currently at track 150 and the disk has requests pending to tracks 34, 153, 44, 203, 61, 98, 25, 115 and 175. Calculate the number of head movements in order to satisfy these requests for C-SCAN and C-LOOK scheduling algorithms.

c) Explain the phenomenon of Belady's Anomaly with proper justification.

Consider the following string of page requests. Assume that there are 3 free frames initially in the main memory. Calculate the number of page faults using LRU and the algorithm which causes Belady's anomaly.

String of page requests: 5,4,7,6,5,8,4,8,6,7,4,8,6,5,7.

[(3+3)+(3+3)+(2+3+3)=20]

Or,

4. a) Define the following terms:

Seek time, Rotational latency, Turnaround time, Dispatch latency.

b) Distinguish between direct and indirect mode of addressing. Use necessary diagrams where needed.

c) Discuss the role of lazy swapper in a demand paged memory system. Why it is termed as "lazy"? How can you measure the performance of a demand paging system?

d) What do you mean by cycle time of a pipelined processor? Draw the block diagram of the five stages of a pipelined processor.

[(1.5x4)+3+(2+2+2)+(1+4)=20]

Group-III (CO3)

5. a) Distinguish between mesh and star topologies in terms of robustness, complexity of reconfiguration, security and expense.

b) What do you mean by line coding? In which layer of the OSI model, this is performed? Draw the waveform for the bit stream 01100101 using NRZ-L, RZ and Manchester encoding scheme.

c) Define throughput of a network. Consider a network with bandwidth of 20Mbps which can pass an average of 15,000 frames per minute. If each frame carries an average of 20,000 bits, find the throughput of the network.

[4+(1+1+3+3+3)+(1+4)=20]

Or,

6. a) How can you measure the bit rate of a noiseless channel? Consider a noiseless channel with a bandwidth of 3000 HZ transmitting a signal with 2 signal levels. Calculate the maximum bit rate.

b) What do you mean by SNR? What is the value of SNR for a noiseless channel? The power of a signal is 10mW and the power of the noise is 1 μW. What is the value of SNR?

c) Define the following terms:

Propagation time, Transmission time, Queuing time, Bandwidth (in bps).

d) Discuss the various components of a network. What are the various types of data flow possible in a network?

[(2+3)+(1+2+2)+4+(3+3)=20]

Group-IV (CO4)

7. a) Suppose in the data link layer, a dataword to be transmitted by the sender is 1011. The divisor agreed upon both be the sender and the receiver is 1001. Calculate the codeword which has to be actually sent to the receiver using Cyclic Redundancy Check (CRC) encoding scheme. Now show how the receiver verifies whether the received codeword is valid or corrupted.

b) Design a sender site algorithm for Stop and Wait ARQ protocol.

c) Explain the working principle of ALOHA with the help of a flowchart. Calculate graphically the vulnerable time for pure ALOHA.

[(3+3)+6+(5+3)=20]

Or,

8. a) What is the main drawback of ALOHA? Explain how CSMA provides an improvement over ALOHA.

b) Explain why the sender window size of GO Back N ARQ is chosen to be 2^m-1; and not to be 2^m. where m indicates the number of bits required to represent the sequence number of a frame. What is the chosen receiver window size for this protocol?

c) What is the main drawback of single bit parity checker? How 2 dimensional parity checker overcomes this problem?

d) Distinguish between 1-persistent CSMA and non-persistent CSMA in terms of bandwidth consumption and probability of collision. What is the added advantage of CSMA/CD over CSMA?

[(2+2)+(5+1)+(2+3)+(3+2)=20]

Group-V (CO5)

9. a) Find the range of assignable IP addresses in the following blocks.

i. 200.17.21.128/27

ii. 17.34.16.0/23

iii. 123.56.77.32/29

b) Mention the class of the following IP addresses.

i. 237.14.2.1

ii. 208.35.54.12

iii. 129.14.6.8

iv. 114.34.2.8

c) Find the net-id and host-id of the following IP addresses.

i. 117.34.3.8

ii. 132.57.8.6

iii. 207.3.54.12

d) Write the following masks in slash notation (/n).

i. 255.0.0.0

ii. 255.255.224.0

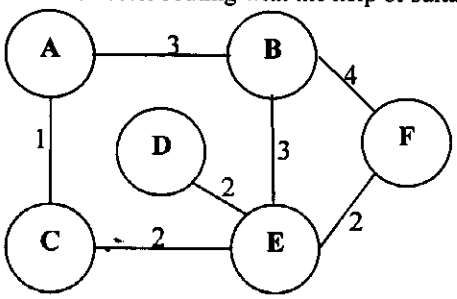
iii. 255.255.255.0

iv. 255.255.240.0

[(2x3)+4+(2x3)+4=20]

Or,

10. a) For the network given below, formulate the routing table for the node E using distance vector routing algorithm. Discuss the problem of distance vector routing with the help of suitable diagrams.



b) What do you mean by address depletion problem? How it can be overcome?

c) What do you mean by an autonomous system? Distinguish between intra-domain and inter-domain routing protocols. Under which category of these two, does this distance vector routing belong and why?

[(6+4)+(3+2)+ (1+2+2)=20]

Course outcomes:

CO1: **Discuss** and **illustrate** the design and architecture of memory and processor.

CO2: **Discuss** and **describe** the various functionalities of operating systems, pipelining and vector processing.

CO3: **Describe** the different network topologies and fundamentals of computer networks.

CO4: **Explain** and **analyze** the data link layer protocols and media access protocols.

CO5: **Demonstrate** and **analyze** different routing protocols and network protocols.