nd March – 2020
Operating Systems (CO302)   Seat No. _____

Time: 14:00 - 15:30 Hours]   [Total Marks: 30]

Instructions: (1) Figures to the extreme right indicate the maximum marks of the respective question.

1. Answer to the following:

a. Explain Linux Thread Model with suitable diagram.   03

b. What are the different principles which must be considered while selecting a scheduling algorithm?   03

c. Distinguish conceptually between an I/O-bound program and a Processor-bound program. Suppose 03 a short-term scheduling algorithm favors those processes that have used little processor time in the past. Which type of programs will this algorithm favor? Justify your answer with appropriate reasoning.

2. Answer to the following: 04

a. Consider following processes with length of CPU burst time in milliseconds

Process Burst-time

P_1 5

P_2 10

P_3 2

P_4 1

All process arrived in order P_1, P_2, P_3, and P_4 all at time zero.

1. Draw Gantt charts illustrating execution of these processes for SJF and Round robin(quantum=1)
2. Calculate waiting time for each process for each scheduling algorithm
3. Calculate average waiting time for each scheduling algorithm

b. Consider a multilevel feedback scheduling policy with five priority queues levels. Each of these 05 priority queues uses the round robin scheduling policy with a time quantum of 3 units, and the maximum execution time at each priority level is two quantum (or 6 units). All jobs needing the CPU begin at the highest priority level and then move down priority levels as the time using the CPU grows. The CPU is always allocated to the highest priority job.

1. Does this scheduling policy work well for CPU bound processes? Explain.
2. Is this scheduling algorithm good for I/O bound processes? Explain.
3. Is starvation possible? If yes, how might you modify you modify the policy to avoid starvation.

3. Answer to the following: 04

a. Explain with flowchart operation of Paging and Translation Lookaside Buffer (TLB).

b. A certain computer system has the segmented paging architecture for virtual memory. The memory 04 is byte addressable. Both virtual and physical address spaces contain 2^{16} bytes each. The virtual address space is divided into 8 non-overlapping equal size segments. The memory management unit (MMU) has a hardware segment table, each entry of which contains the physical address of the page table for the segment. Page tables are stored in the main memory and consist of 2 byte page table entries. What is the minimum page size in bytes so that the page table for a segment requires at most one page to store it? Also give the division of virtual address for above.

4. Consider we have the following reference string: 5, 0, 4, 4, 0, 3, 0, 4, 1, 0, 2, 0, 5, 3, 0, 1. 04 Find the page fault of virtual memory using (i) Enhanced Clock algorithm, where we used 3 frames and number in bold is with modified bit set.

Date: 10 Dec 2020

Time: 10:00 to 01:00

Max Marks: 100

Instructions:

1. Write your B.Tech. Admission No/Roll No and other details clearly on the answer books while writing your B.Tech. Admission No on the question paper, too.
2. Assume and write necessary data with proper justifications, if any.
3. Be precise and clear in answering the questions.
4. Support your answer with the necessary diagrams and examples.

Q.1 Answer the following. (Any five) [50]

1) Consider dataset that describes the weather conditions for playing a game of golf. Given the weather conditions, each tuple classifies the conditions as fit ("Yes") or unfit ("No") for plaing golf. use **naive bayes classifier** to find probability that a player can play golf or not , given today's weather (i.e. Sunny, Hot, Normal, False) find probability P(Yes|Sunny, Hot, Normal, False) and P(No|Sunny, Hot, Normal, False)

	OUTLOOK	TEMPERATURE	HUMIDITY	WINDY	PLAY GOLF
0	Rainy	Hot	High	False	No
1	Rainy	Hot	High	True	No
2	Overcast	Hot	High	False	Yes
3	Sunny	Mild	High	False	Yes
4	Sunny	Cool	Normal	False	Yes
5	Sunny	Cool	Normal	True	No
6	overcast	Cool	Normal	True	Yes
7	Rainy	Mild	High	False	No
8	Rainy	Cool	Normal	False	Yes
9	Sunny	Mild	Normal	False	Yes
10	Rainy	Mild	Normal	True	Yes
11	overcast	Mild	High	True	Yes
12	overcast	Hot	Normal	False	Yes
13	Sunny	Mild	High	True	No

2) Construct by hand a neural network that computes the given below functions of two inputs. (Clearly mentation all necessary assumptions such as initial weight, bias, activation function, etc. also perform at least three epochs)

    1. OR   2.AND

3) "As per the law, it is a crime for an American to sell weapons to hostile nations. Country A, an enemy of America, has some missiles, and all the missiles were sold to it by Robert, who is an American citizen."

Prove that "**Robert is criminal.**" (Use Forward Chaining)

4) Answer following Questions.
    a) State difference between PCA and LDA.
    b) What is "curse of dimensionality" and how to deal with it?
    c) Difference between K-Means and K-Medoids.

5) The 8 puzzle consists of eight numbered, movable tiles set in a 3x3 frame. One cell of the frame is always empty thus making it possible to move an adjacent numbered tile into the empty cell. Draw a complete search tree for given Start and Goal state, up to depth level 3 (where Start state is at depth 0) and give unique ID to each node of the tree.
Give the Node Traversal sequence for the following search approaches

a) Brute-Force Approach
b) Depth-First Search (DFS)
c) Depth-First Iterative Deepening (DFID) Search

Hill Climbing (where heuristic function h = number of tiles that are not in the correct place (not counting the blank))

Start state

1	2	3
4	8	5
7	6	

Goal state

1	2	3
	8	5
4	7	6

Also comment on the performance of all the search techniques.

6) Explain Expert System with proper block diagram. Describe each block the of an Expert System. Explain working of each blocks for MYCIN- an expert system.

[50]

Q.2 **Answer the following. (Any five)**

1) Convert the following sentences in to predicate logic to design the knowledge base.
   a) Every person loves themself.
   b) Everyone loves some person who loves themself.
   c) All gardeners like the sun.
   d) Some person loves no one except themself.
   e) Toby loves everyone who loves him.
   f) Love is never requited. (Expand out the meaning of requited.)
   g) Brown frogs are bigger than green frogs.
   h) No natural food is blue.
   i) Mary gave an apple to Tom.
   j) One of the apples that Mary gave to Tom is Rotten.

2) Consider the graph given in Figure.

   i. Write the membership functions corresponding to the fuzzy sets. Hence answer the question: How cool is 36°F?

   ii. Explain the methods of defuzzification.

   Elaborate on Fuzzy Inference Systems
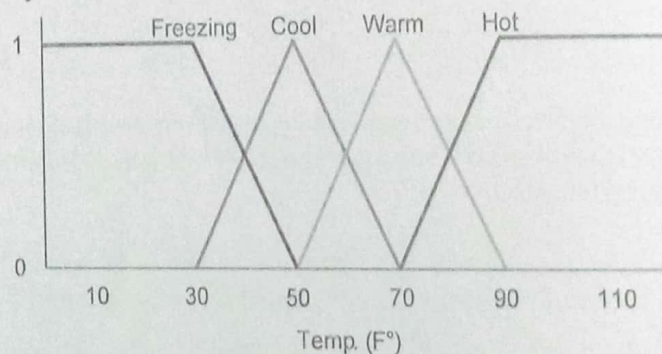
3) Consider the following game tree of given figure. Assume that the children of each node are evaluated from left to right.

   i. Use the Minimax to compute the value of each node in the game tree.

   ii. List the nodes that are evaluated by Alpha-Beta.

   iii. Redraw the game tree such that Alpha-Beta performs the minimum number of evaluations (i.e., the best case for Alpha-Beta). How many nodes are evaluated by Alpha Beta in the resulting game tree?

   Redraw the game tree such that Alpha-Beta performs the maximum number of evaluations

(i.e., the worst case for Alpha-Beta). How many nodes are evaluated by Alpha-Beta in the resulting game tree?
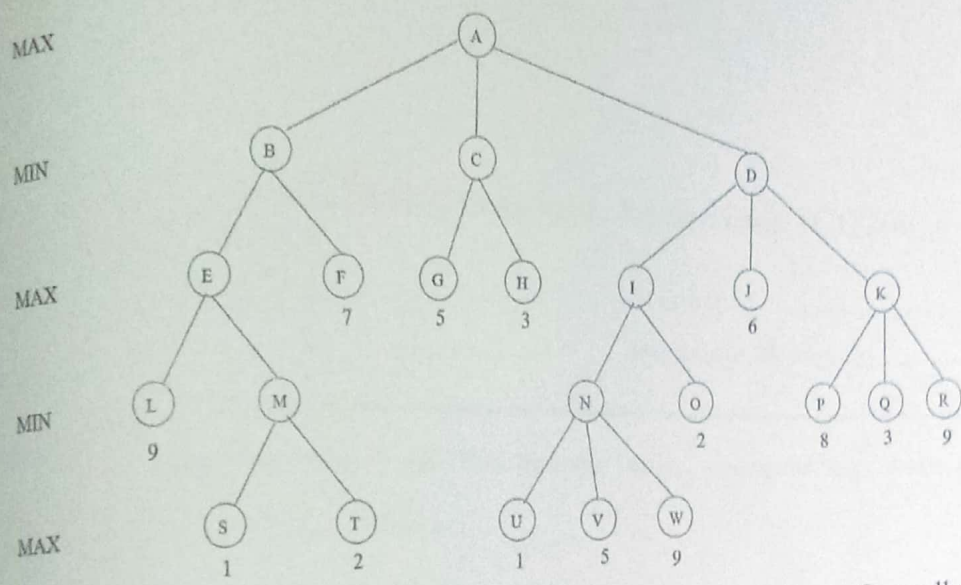
The 8 puzzle consists of eight numbered, movable tiles set in a 3x3 frame. One cell of the frame is always empty thus making it possible to move an adjacent numbered tile into the empty cell. Draw a complete search tree for given Start and Goal state, up to depth level 3 (where Start state is at depth 0) and give unique ID to each node of the tree.

1. Give the Node Traversal sequence for 1) Best First Search and 2) A* for the following Heuristics search approaches

   a. Heuristic search using the heuristic function h = number of tiles that are not in the correct place (not counting the blank).
   b. Heuristic search using the Manhattan heuristic function.

Start state

1	2	3
4	8	5
7	6	

Goal state

1	2	3
	8	5
4	7	6

Consider the following data set consisting of the scores of two subjects on each of seven individuals cluster individuals into two different clusters Using K-means Clustering.

Subject	A	B
1	1.0	1.0
2	1.5	2.0
3	3.0	4.0
4	5.0	7.0
5	3.5	5.0
6	4.5	5.0
7	3.5	4.5

Explain Filter methods and Wrapper Methods.

S. V. NATIONAL INSTITUTE OF TECHNOLOGY
2nd March 2017   M.Sc. Mathematics - III, Semester – VI Mid-Semester Exam   Seat No. _____
02:00-03:30PM   OPERATING SYSTEMS
Instructions: (1) Figures to the extreme right indicate the maximum marks of the respective question.

[Total Marks: 30]

Q-1   Answer the following[Any Five]:

10

1.   What is an operating system? State the differences between batch and time sharing operating systems.
2.   Define race condition with example.
3.   What is Thread? State the differences between process and thread.
4.   Which scheduler maintains the Degree of Multiprogramming ? Justify your answer.
5.   Explain with diagram: Preemptive and Nonpreemptive scheduling.
6.   What do you mean by memory compaction and state limitations of memory compaction?
7.   Differentiate between Logical address space and physical address space.

Q-2   Answer the following:

1.   What do you mean by fragmentation? State the differences between internal and external fragmentation.   03

2.   Draw and explain process state diagram.
3.   Given memory partition of 100 K, 500 K, 200 K, 300 K and 600 K (in order). How   03
would each of the first fit, best fit and worst fit algorithms place the processes of 212 K,   04
417 K, 112 K and 426 K(in order)? Which algorithm makes the most efficient use of memory?

4.   Consider a logical address space of 8 pages of 1024 word each mapped onto a physical   04
memory of 32 frames. How many bits are there in logical and physical addresses? Also
find the size of page table in bytes.

5.   Consider the following schedule of periodic processes: 06

Process Name	Arrival Time	Burst Time
P1	2	8
P2	7	1
P3	6	2
P4	3	6
P5	5	4

a)   Draw Gantt charts illustrating the execution of these processing using Preemptive Shortest Job First (SJF)
b)   What is waiting time of each process? Also calculate average waiting time.
c)   What is Turnaround time of each process? Also calculate average Turnaround time.
d)   What is Context Switching? How many times it will occur in above example?

Dated: 29th Nov 2017

Time: 12:00 hrs to 15:00 hrs

Instructions: Max Marks: 50

1. Write your Admission No/Roll No and other details clearly on the answer books while write your Admission No on the question paper, too.
2. Be precise and clear in answering the questions.
3. Support your answer with necessary diagrams and examples.

**Q-1   Answer the following questions (Any ten)**

20

1. Sketch the Bipolar and NRZI encoding for the bit stream 0001110101. Assume that the NRZI signal starts out low.

2. What is switching? Compare switching techniques with example.

3. Calculate the Shannon channel capacity in the following cases:
   a)   i) Bandwidth =20Khz SNRdb=40
   b)   A file contains 3 million bytes. How long does it take to download this file using 100 kbps.

4. Is it possible for an application to enjoy reliable data transfer even when the application runs over UDP? Justify your answer.

5. Suppose Host A sends two TCP segments back to back to Host B over a TCP connection. The first segment has sequence number 90; the second has sequence number 110.
   a. How much data is in the first segment?
   b. Suppose the first segment is lost but the second segment arrives at B. In the acknowledgement that Host B sends to Host A, what will be the acknowledgement number?

6. Suppose you are sending an email from your Hotmail account to your friend, who reads his/her e-mail from his/her mail server using IMAP. Briefly describe how your email travels from your host to your friend's host. Also, what is the application layer protocols involved?

7. For the following error detection methods discuss the case in which they fail to detect errors.
   a) Byte stuffing b) VRC

8. Draw a timeline diagram (up to frame 7) that for the sliding window algorithm with SWS=4 frames and RWS=3 frames, when the third frame (frame 2) is lost. The receiver use cumulative ACKs. Use a timeout interval of about 2 x RTT. Assuming that the transmit time (insertion delay) of a frame is equal to 0.25 RTT and the frames can be processed instantaneously if they arrive in order. On each data frame and ACK frame, you need to indicate the sequence number (start from 0). In addition, you need to indicate what action is taken by the receiver when it is received, for example, processed, buffered, and discarded.

9. Consider a token ring network like FDDI in which a station is allowed to hold the token for some period of time (the token holding time, or THT). Let Ring Latency denote the time it takes the token to make one complete rotation around the network when none of the stations have any data to send.
   a) In terms of THT and Ring-Latency, express the efficiency of this network when only a single station is active.
   b) What setting of THT would be optimal for a network that had only one station active (with data to send) at a time?

10. Differentiate between: a) ARP and RARP b) TCP and UDP

11. In a CDMA system the four chip sequences are:
A=(-1 -1 -1 +1 +1 -1 +1 +1) B=(-1 -1 +1 -1 -1 +1 +1 -1)
C=(-1 +1 -1 +1 +1 -1 -1 -1) D=(-1 +1 -1 -1 -1 -1 +1 -1) in bipolar form.
If the received sequence is (-1 +1 -3 +3 +1 -1 -1 +1) what is the data transmitted by the four stations.

Q-2   Answer the following Questions. (Any Six)   30

1. Explain AAL reference structure.
2. What is Congestion? Explain Congestion control in TCP and Frame Relay.
3. What is the purpose of a subnet mask? Is the subnet mask 255.255.0.255 valid for a Class A address? Justify. Suppose you have sub-netted your class C network 192.168.1.0 with a subnet mask of 255.255.255.240. Please list the following: number of networks, number of hosts per network, the full range of the first three networks, and the usable address range from those first three networks.
4. Solve these with help of Polynomials.
   Given the data word 1010011110 and the divisor 10111.
   a) Show the generation of the code-word at the sender site using binary division.
   b) Show the checking of the code-word at the receiver site assuming no error has occurred.
   c) What is the syndrome at the receiver end if the data-word has an error in the 5th bit position counting from the right? Namely: data-word 1010001110 is received.
5. Explain 802.4 priority schemes with example.
6. Figure, the data rate is 10 Mbps, the distance between station A and C is 2000 m, and the propagation speed is 2 x 108 m/s. Station A starts sending a long frame at time t1 =0µs; station C starts sending a long frame at time t2 b =3µs, if the size of the frame is long enough to guarantee the detection of collision by both stations. Repeat same for data rate 100 Mbps. Find the following.
   a. The time when station C hears the collision (t3).
   b. The time when station A hears the collision (t4).
   c. The number of bits station A has sent before detecting the collision.
   d. The number of bits station C has sent before detecting the collision.
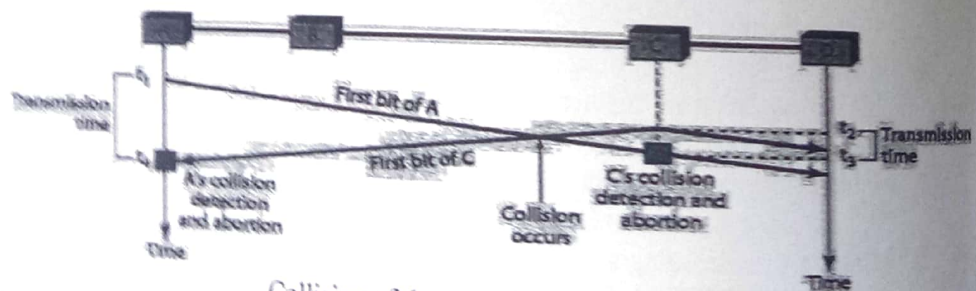
Collision of the first bit in CSMA/CD

7. Consider the network shown below.
   a) Show the operation of Dijkstra's (Link State) algorithm for computing the least cost path from F (the rightmost node in the figure below) to all destinations. Also explicitly list all the shortest path routes from F to all destinations that are the result of the algorithm's computation.
   b) Show the distance table that would be computed by the distance vector algorithm in B.

2