Semester IV (B.Tech)

Number of printed pages 02

Er. No.....

Academic Year: 2021-22

Jaypee University of Engineering & Technology, Guna

T-2 (Even Semester 2022)

18B11CI412 –Algorithms and Problem Solving

Maximum Duration: 1 Hour 30 Minutes

Maximum Marks: 25

Notes:

1. This question paper has 5 questions.
2. Write relevant answers only.
3. Do not write anything on question paper (Except your Er. No.).

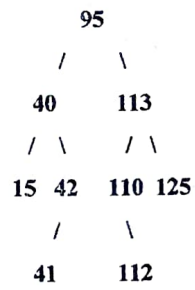
Q1. **(a)** There are sorting algorithms that run faster than O ($n \log n$) time but they require special assumptions about the input sequence to be sort. Name these sorting algorithms and explain the special assumptions about the input sequence to be sort by algorithms. [02]

(b) Illustrate the operation of *COUNTING-SORT* on the array A=[6,0,2,0,1,3,4,6,1,3,2]. [03]

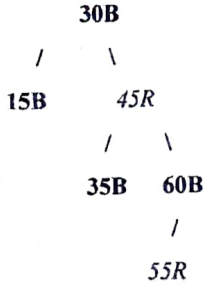
Q2. **(a)** Why can't a Red-Black tree have a black node with exactly one black child and no red child? [01]

(b) What is Binary Search Tree (BST)? Construct a BST for the following numbers: 47, 55, 23, 17, 39, 11, 50, 9, 19, 74, 33, 28 .Show all the steps. [02]

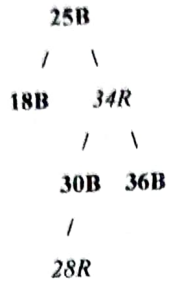
(c) Given the following BST, show its value after deleting 95. [02]



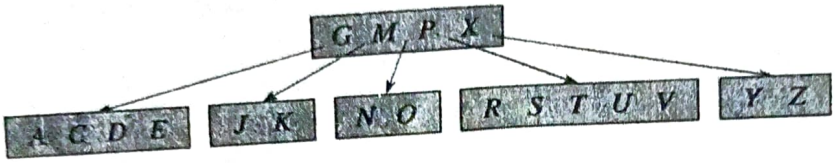
Q3. **(a)** Show the result of inserting 50 into the Red-Black tree depicted below: (Mark the red nodes with an "R" and the black nodes with "B" and show the black nulls at the leaves) [02]



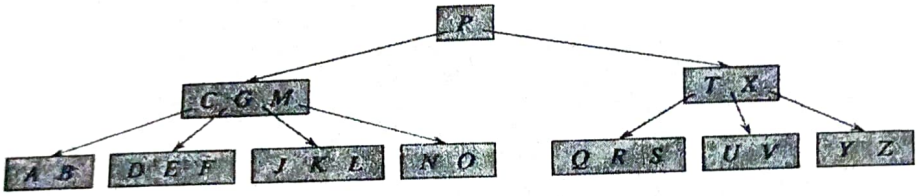
(b) Show the result of inserting 29 into the Red-Black tree depicted below:



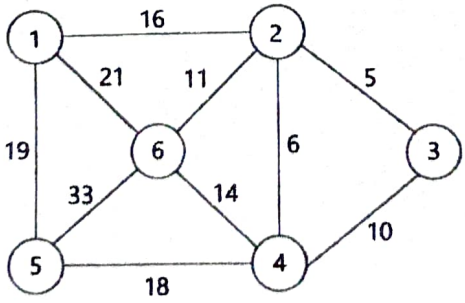
Q4. (a) Draw all instance of B-tree after successively inserting keys **B, Q, L** and **F** into a given B-tree. The minimum degree t for this B-tree is 3, so a node can hold at most 5 keys. [02]



(b) Draw all instance of B-tree after successively deleting keys **L, C, G, E** and **B** from given B-tree. The minimum degree t for this B-tree is 3, so a node can hold at most 5 keys. [03]



Q5. What do you mean by spanning tree of a graph? Find the minimum spanning tree of the following graph using suitable algorithm which grows multiple trees (i.e., a forest) at the same time and trees are merged together using **safe** edges. [05]



Number of printed page 1

Semester IV (B.Tech)

Er. No. 201B041

Academic Year: 2021-22

Jaypee University of Engineering & Technology, Guna

T-2 (Even Semester 2022)

18B11HS411 – LIFE SKILLS

24

Maximum Duration: 1 Hour 30 Minutes

Maximum Marks: 25

Notes:

1. This question paper has 05 questions.
2. Write relevant answers only.
3. Do not write anything on question paper (Except your Er. No.).

Q1. Elaborate with examples the five short-cuts used by the people to judge others. **[5]**

Q2. "Emotional intelligence is a cluster of skills, capabilities, and competencies that influence a person's ability to succeed in coping with environmental demands and pressures." Enlighten the statement by describing the five dimensions of emotional intelligence. **[5]**

Q3. What is more important today personality–job fit or personality–organization fit? Justify your answer. Describe in brief Big Five Model of Personality. **[1+1+3]**

Q4. Explain attribution theory. Draw an attribution theory diagram clearly showing the links among observation, interpretation, and attribution of cause. **[2+3]**

Q5. What behavioural predictions you might make if you knew that an employee had: **[2+3]**

- An external locus of control
- A low Mach score

Justify how personalities differ on the following workplace aspects with reference to the attribute of "locus of control" :

- Response to others
- Risk-taking propensity
- Job satisfaction

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Semester IV (B.Tech.)

Number of printed pages: 01
Er. No.....
Academic Year: 2021-22

Jaypee University of Engineering & Technology, Guna

T-2 (Even Semester 2022)

18B11CI411 – COMPUTER NETWORKS

Maximum Duration: 1 Hour 30 Minutes

Maximum Marks: 25

Notes:

1. This question paper has **five** questions.
2. Write relevant answers only.
3. Do not write anything on question paper (Except your Er. No.).

			Marks
Q1.	(a)	What is the need of flow control? Explain the common approaches for flow control in data link layer.	[03]
	(b)	A bit string 0111101111101111110, needs to be transmitted at the data link layer. What is the string actually transmitted after bit stuffing?	[02]
Q2.	(a)	In a slotted ALOHA network with G=1/2, how is the throughput affected in each of the following cases? (i) G is increased to 1 (ii) G is decreased to 1/4	[03]
	(b)	A path in a digital circuit-switched network has a data rate of 1Mbps. The exchange of 1000 bits is required for the setup and teardown phases. The distance between two stations is 5000 km and propagation speed is 2×10^8 m/s. Determine the total delay if 100,000 bits of data are exchanged during the data transfer phase.	[02]
Q3.	(a)	Describe the working principle of carrier sense multiple access with collision detection (CSMA/CD).	[03]
	(b)	In Stop-and-Wait ARQ system, the bandwidth of the line is 2 Mbps, and 2 bits take 40 ms to make a round trip. What is the bandwidth-delay product? If the system data frames are 2000 bits in length, what is the utilization percentage of the link?	[02]
Q4.	(a)	Using 5-bit sequence numbers, what is the maximum size of the send and receive windows for each of the following protocols? (i) Stop-and-Wait ARQ (ii) Go-Back-N ARQ (iii) Selective-Repeat ARQ	[03]
	(b)	Given the data-word 1010011110 and the divisor 10111, (i) Show the generation of the CRC codeword at the sender site. (ii) Show the checking of the codeword at the receiver site (assume no error).	[02]
Q5.	(a)	Discuss the digital to analog conversion techniques with the help of suitable waveforms.	[03]
	(b)	A network with bandwidth of 10 Mbps can pass only an average of 12,000 frames per minute with each frame carrying an average of 10,000 bits. What is the throughput of this network?	[02]

Semester IV (B.Tech) **Number of printed pages 02**

Er. No.....

Academic Year: 2021-22

Jaypee University of Engineering & Technology, Guna

T-2 (Even Semester 2022)

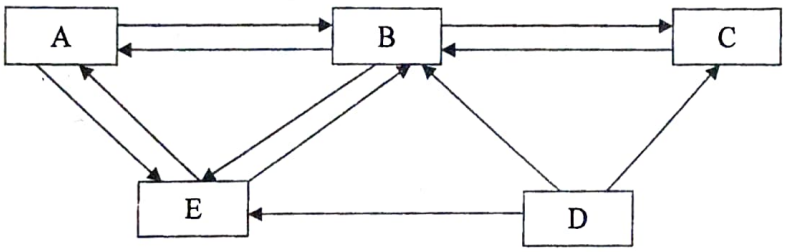
18B14HS441-Concept of Digital Marketing

Maximum duration: 1 Hour 30 Minutes (15) Maximum Marks: 25

Notes:

1. This question paper has 5 questions.
2. Write relevant answers only.
3. Do not write anything on question paper except Enroll No.

Q1. Using the graph shown below, compute the PageRank at every node at the end of the third iteration. Use damping factor=0.85. (Take up to three decimals) **[05]**



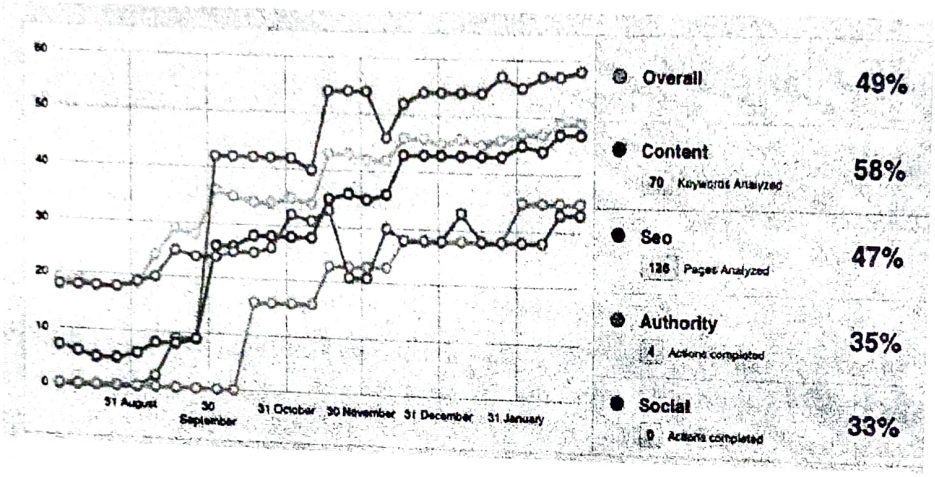
Q2. 'The importance of Pay Per Click (PPC) rests on a business's ability to accurately read their data, make adjustments to ad campaigns, wait for new data to come in, and then measure the effectiveness of their changes'. Given the statement, explain the importance of PPC concerning other digital marketing tools. **[05]**

Q3. 'SEO is the practice of increasing the quantity and quality of traffic to your website through organic search engine results.' Justify your opinion by explaining the various types of SEO and how it is different from each other? **[05]**

Q4. 'Every organization wants to have good, attractive, and engaging content for its users.' Elucidate the statement with the help of factors important to create relevant and attractive content. **[05]**

Q5. Case Study:

Fieldwire, a web and mobile collaboration platform for the commercial construction industry, had a stronger focus on product and engineering but was lacking marketing-focused content. CanIRank helped them shift their focus from conversion to traffic generation and got them to rank in the top three search results for all their main keywords.



(a) Explain the strategies should Fieldwire and CanIRank adopt to increase the traffic on their web portal. [03]

(b) Why Fieldwire has not opted for traditional marketing? Elucidate the results expected from the various digital marketing strategies. [02]

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Semester IV (B. Tech)

Number of printed pages:02

Er. No.....

Academic Year: 2021-22

Jaypee University of Engineering & Technology, Guna

T-2 (Even Semester 2022)

18B11CI413 – OPERATING SYSTEMS

Maximum Duration: 1 Hour 30 Minutes

Maximum Marks: 25

Notes:

1. This question paper has five questions.
2. Write relevant answers only.
3. Do not write anything on question paper (Except your Er. No.).

Marks

Q1. Consider a system implementing multilevel queue scheduling. What strategy can a computer user employ to maximize the amount of CPU time allocated to the user's process? **[05]**

Q2. Assuming a 1-KB page size, what are the page numbers and offsets for the following address references (provided as decimal numbers). **[05]**

(a) 3085
(b) 42095
(c) 215201
(d) 650000
(e) 2000001

Q3. Given five memory partitions of 400KB, 200KB, 450KB, 350KB and 550 KB (in order), how would the first fit, best fit and next fit algorithms place processes request of 317KB, 194 KB, 217KB and 440 KB (in order)? **[05]**

Q4. Consider a paging hardware with a TLB. Assume that the entire page table and all the pages are in the physical memory. It takes 10 milliseconds to search the TLB and 80 milliseconds to access the physical memory. If the TLB hit ratio is 0.6, Calculate the effective memory access time. **[05]**

Q5. Consider the logical address memory of size 32KB using a page size of 8 KB and a physical memory of 64KB. A page table entry along with base address is given in the table below. Calculate the Physical address for 26KB virtual address. **[05]**

Table: Page Table Entry

Page Number	Base
0	1
1	4
2	3
3	7

Number of printed pages 2

Er. No. 20103[illegible]

...mester IV (B.Tech)

Academic Year:2021-22

Jaypee University of Engineering &Technology, Guna

T-2(Even Semester 2022)

14B11CI711–Artificial Intelligence & Applications

Maximum Duration: 1 Hour 30 Minutes

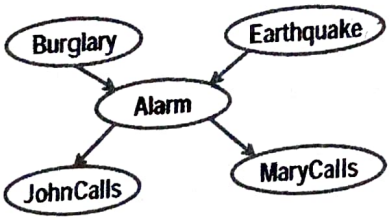
Maximum Marks: 25

Notes:

1. This question paper has four questions.
2. Use of calculator is permitted.
3. Do not write anything on question paper (Except your Er. No.).
4. Answer the questions in serial order.

Marks

Q1. A Bayesian Belief Network for the Burglary-Earthquake-Alarm belief system is shown below. Also the conditional probability tables for the Burglary-Earthquake-Alarm belief system for John and Mary giving/not giving a call on various states of alarm has been provided: **[10]**



B	E	P(A)
T	T	0.95
T	F	0.95
F	T	0.29
F	F	0.001

A	P(J)
T	0.90
F	0.05

A	P(M)
T	0.70
F	0.01

P(E)
0.002

P(B)
0.001

Compute the joint probability distribution of the event that the alarm has sounded but neither a burglary nor an earthquake has occurred, and both Mary and John call. For the remaining probabilities of other variables and/or their combinations (as mentioned in the table below) show and solve every step and fill the table below:

P(A)	P(J)	P(AB)	P(A'B)	P(AE)	P(AE')	P(A'E')	P(JB)	P(J/B)	Solution of the Question Above

Q2. Consider the following Knowledge Base: **[05]**

1. John likes all kinds of food.
2. Apples are food.
3. Chicken is food.
4. Anything anyone eats and isn't killed by is food.
5. Bill eats peanuts and is still alive.
6. Sue eats everything Bill eats.

i. Translate these sentences into formulas in FOPL.
ii. Convert the formulas into clause form.
iii. Use resolution to prove that John likes peanuts.

Q3. Deduce the information given below using propositional logic by showing every step: **[05]**
"If I am the President then I am well known. I am not the President. So I am not well known."

Q4. Explain Deduction, Induction, Abduction, and Analogy using examples. **[05]**

Number of printed pages 02

Er. No.....

Semester IV (B.Tech) Academic Year: 2021-22

Jaypee University of Engineering & Technology, Guna

T-3 (Even Semester 2022)

18B11CI412 –Algorithms and Problem Solving

Maximum Duration: 2 Hours Maximum Marks: 35

Notes:

1. This question paper has 5 questions.
2. Write relevant answers only.
3. Calculator not allowed.
4. Do not write anything on a question paper (Except your Er. No.).

Q1. **(a)** How is Dynamic Programming different from Recursion and Memoization? Illustrate use of Memoization for finding N^{th} Fibonacci number? [03]

(b) What happens when a top-down approach of dynamic programming is applied to any problem? [02]

Q2. **(a)** Design an algorithm to Convert Max-Heap to Min-Heap. Proof the correctness of algorithm using loop invariant method with example. [03]

(b) Describe the method for analyzing an algorithm and what do you mean by Best case, Average case & Worst-case complexities of an algorithm? [02]

Q3. **(a)** The order of a leaf node in a tree B+tree is the maximum number of (value, data record pointer) pairs it can hold. Given that the block size is 1K bytes, the data record pointer is 7 bytes long, the value field is 9 bytes long and a block pointer is 6 bytes long. What is the order of the leaf node? [03]

(b) Can the master method be applied to solve recurrence T (N) =4T (N/2) ~~+N2logN~~ $N^2 \log N$? Explain why or why not. [02]

Q4. **(a)** Four matrices M1, M2, M3 and M4 of dimensions pXq, qXr, rXs and sXt respectively can be multiplied in several ways with different numbers of total scalar multiplications. Find the number of scalar multiplications needed, (i) when multiplied as *((M1 X M2) X (M3 X M4))*, and (ii) when multiplied as (((M1 X M2) X M3) X M4). Which combination required the minimum number of scalar multiplication, If p = 10, q = 100, r = 20, s = 5 and t = 80. [03]

(b) An algorithm to find the length of the longest monotonically increasing sequence of numbers in an array A [0 :n-1] is given below. Let Li denote the length of the longest monotonically increasing sequence starting at index i in the array.

Initialize $L_{n-1} = 1$

For all i such that $0 \le i \le n-2$

$$L_i = \begin{cases} 1 + L_{i+1} & \text{if } A[i] < A[i+1] \\ 1 & \text{Otherwise} \end{cases}$$

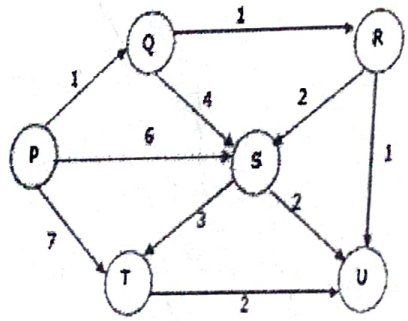
Finally the length of the longest monotonically increasing sequence is $\text{Max}(L_0, L_1, \ldots, L_{n-1})$.

Which algorithm design paradigm is used by the above algorithm? Explain

Q5. **(a)** Consider the weights (W-in Kgs) and values (V-in Rupees) of four items are given as (10, 60), (7, 28), (4, 20), (2, 24). Note that there is only one unit of each item. The task is to pick a subset of these items such that their total weight is no more than 11 Kgs and their total value is maximized. Moreover, no item may be split. The total value of items picked by an optimal algorithm is denoted by Vopt. A greedy algorithm sorts the items by their value-to-weight ratios in descending order and packs them greedily, starting from the first item in the ordered list. The total value of items picked by the greedy algorithm is denoted by Vgreedy. Find the value of Vopt – Vgreedy. [03]

(b) Explain key factors for preferring B+-trees instead of binary search trees for indexing database relations? [02]

Q6. **(a)** Suppose we run Dijkstra's single source shortest-path algorithm on the following edge weighted directed graph with vertex P as the source. In what order do the nodes get included into the set of vertices for which the shortest path distances are finalized? [03]



(b) Given an array where numbers are in range from 1 to n^6, design an efficient sorting algorithm to sort these numbers in linear time? [02]

Q7. Write short notes on following (with example)

(a) Greedy choice property Vs Principle of optimality [03]

(b) Convergence property and Path relaxation property [02]

Number of printed pages 2

Semester IV (B.Tech)

Er. No.....
Academic Year: 2021-22

Jaypee University of Engineering & Technology, Guna

T-3 (Even Semester 2022)

18B11CI411 – Computer Networks

Maximum Duration: 2 Hours

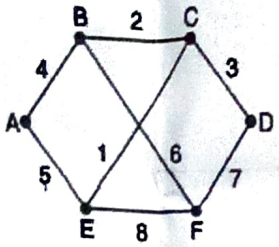
Maximum Marks: 35

Notes:

1. This question paper has 7 questions.
2. Write relevant answers only.
3. Do not write anything on question paper (Except your Er. No.).

			Marks
Q1.		Generate the chip sequence for the four stations. Compute the data to be transferred through common channel if the original sequence of data is {0, 1,-, 0}. Here ' -' represent the silent station.	[05]
Q2.		Describe the different types of channelization protocols used in media access control (MAC).	[05]
Q3.	(a)	If an Ethernet destination address is **07:01:02:03:04:05**, what is the type of the address?	[03]
	(b)	Show the original (unabbreviated) form of the IPV6 address **0: AA :: 0.**	[02]
Q4		An ISP is granted a block of addresses starting with 120.60.4.0/22. The ISP wants to distribute these blocks to 100 organizations with each organization receiving just eight addresses. Design the sub-blocks and give the slash notation for each sub-block. Find out how many addresses are still available after these allocations.	[05]
Q5		What is the purpose of domain name system (DNS)? Discuss three main divisions of domain name space.	[05]
Q6		Explain user datagram format in detail. In TCP, if the value of HLEN is 0111, how many bytes of option are included in the segment?	[05]

7 (a) Use link state routing algorithm to compute the routing table for node B and node D of the network as given in the Fig. 1.



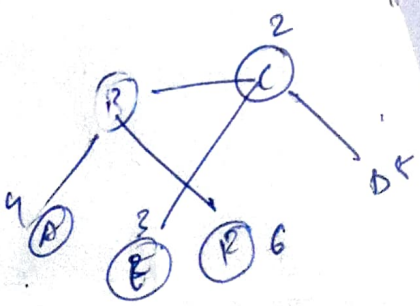


Fig.1

(b) Explain the fundamental principle of Leaky bucket algorithm with suitable diagram. [02]

Number of printed pages:02

Semester IV (B.Tech)

Er. No.....
Academic Year: 2021-22

Jaypee University of Engineering & Technology, Guna

T-3 (Even Semester 2022)

18B11CI413 - OPERATING SYSTEMS

Maximum Duration: 2 Hours

Maximum Marks: 35

Notes:

1. This question paper has five questions.
2. Write relevant answers only.
3. Do not write anything on a question paper (Except your Er. No.).

Marks

Q1. Describe a mechanism for enforcing memory protection in order to prevent a program from modifying the memory associated with other programs. **[06]**

Q2. Consider the following set of processes, with the length of the CPU burst given in milliseconds: **[07]**

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	4
P4	1	5
P5	5	2

(a) Show the scheduling order of the processes using the Gantt chart.
(b) What is the turnaround time for each process?

Q3. How does the signal() operation associated with monitors differ from the corresponding operation defined for semaphores? **[07]**

Q4. Consider the following snapshot of a system:

Process	Allocation				Max			
	A	B	C	D	A	B	C	D
P0	3	0	1	4	5	1	1	7
P1	2	2	1	0	3	2	1	1
P2	3	1	2	1	3	3	2	1
P3	0	5	1	0	4	6	1	2
P4	4	2	1	2	6	3	2	5

Using the banker's algorithm, determine whether or not each of the following states is unsafe. If the state is safe, illustrate the order in which the processes may complete. Otherwise, illustrate why the state is unsafe.

(a) Available = (0,3,0,1)
(b) Available = (1,0,0,2)

[07]

Q5. Consider the following page reference string:

7,2,3,1,2,5,3,4,6,7,7,1,0,5,4,6,2,3,0,1

Assuming demand paging with three frames, how many page faults would occur for the following replacement algorithms?

(a) LRU replacement
(b) FIFO replacement
(c) Optimal Replacement

Number of printed pages 01

[80]

ester IV (B.Tech)

Er. No.....

Academic Year: 2021-22

Jaypee University of Engineering & Technology, Guna

T-3 (Even Semester 2022)

18B14HS441-Concept of Digital Marketing

Maximum duration: 2 Hours

Maximum Marks: 35

Notes:

1. This question paper has 7 questions.
2. Write relevant answers only.
3. Do not write anything on the question paper except Enroll No.

Q1. According to US Marketers (2017), explain five leading objectives of social media and their importance with the help of a relevant example. **[05]**

Q2. "To create a successful social media marketing campaign, organizations must think about the target group and their interest". Are you agree with the statement, elucidate your opinion with reference to the classification of audience groups and their interest? **[05]**

Q3. "Web analytics is the measurement and analysis of data to inform an understanding of user behavior across web pages". In lieu of the statement, explicate the outcome analysis and its various methods. **[05]**

Q4. "Social listening is the monitoring of your brand's social media channels for any customer feedback and direct mentions of your brand or discussions regarding specific keywords, topics, competitors, or industries, followed by an analysis to gain insights and act on those opportunities". Are you agree with the statement, and justify your answer with the help of various social listening applications? **[05]**

Q5. Explain the different types of campaigns in the Google Display Advertisement with the help of examples. **[2+2+1]**

Q6. Why Ad Rank is important for any organization? How does any organization increase the ad rank of a PPC ad campaign? Justify your answer with the help of a relevant example. **[05]**

Q7. "Developing a digital marketing plan will help you identify what makes your business unique and how to get your message out to your audiences through a variety of digital channels". In lieu of the statement, elucidate the digital marketing plan for a new startup related to IT industry startup.

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Number of printed page 1

Semester IV (B.Tech)

Er. No.....

Academic Year: 2021-22

Jaypee University of Engineering & Technology, Guna

T-3 (Even Semester 2022)

18B11HS411 – LIFE SKILLS

Maximum Duration: 2 Hours

Maximum Marks: 35

Notes:

1. This question paper has 07 questions.
2. Write relevant answers only.
3. Do not write anything on question paper (Except your Er. No.).

Q1. What is the main difference between operant and classical conditioning? Why classical conditioning is considered a form of memory? State the applications based on the principles of classical conditioning. **[2+1+2]**

Q2. List six major sources of conflict in organizations. Explain in brief. **[5]**

Q3. Explain the factors that create stress. Mention few stress relief strategies. **[2.5+2.5]**

Q4. What are the critical limitations of Holland's theory of personality? State the underlying assumptions of Holland's theory. **[2.5+2.5]**

Q5. "Self-fulfilling prophecy is the perception tendency for someone's expectations about another to cause that person to behave in a manner consistent with those expectations". Enlighten the statement with an example. What are the implications of self-fulfilling prophecy in the workplace? **[2.5+2.5]**

Q6. Differentiate between transactional and transformational leadership with the help of a suitable diagram. **[5]**

Q7.

- How would you apply Fiedler's theory of leadership in an organization? **[2.5+2.5]**
- What factors should be taken into consideration when deciding upon which leadership style to adopt?

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Number of printed pages 2

Er. No. 21801...

Academic Year: 2021-22

IV (B.Tech)

Jaypee University of Engineering & Technology, Guna

T-3 (Even Semester 2022)

14B11CI711–Artificial Intelligence & Applications

Maximum Duration: 2 Hours

Maximum Marks: 35

Notes:

1. This question paper has four questions.
2. Use of calculator is permitted.
3. Do not write anything on question paper (Except your Er. No.).
4. Answer the questions in serial order.

Marks

Q1. For two person game between A and B where P1, P2 and Q1, Q2 are the number of times the options that may be used and their equations are: **[07]**

$U \leq 3P1 + P2$ & $U \leq -2P1 + 2P2$ then

I. Is there a saddle point?
II. Calculate the values of : P1, P2, Q1, Q2.
III. Calculate the values of : A's payoff and B' payoff.

Q2. Bob and Alice is accomplice in a crime and their punishments are as mentioned in the matrix given below in Fig1. What is the right pure strategy for Alice or Bob assuming both want to maximize their own expected utility strictly in the light of Prisoner's Dilemma Strategy? **[07]**

	Bob: testify	Bob: refuse
Alice: testify	A = -5, B = -5	A = 0, B = -10
Alice: refuse	A = -10, B = 0	A = -1, B = -1

Figure 1

Q3. In cases where knowledge exists, but the process for using it takes too long or is expensive to scale. Such is often the case with knowledge developed by financial advisers. Which areas of artificial intelligence may be applied to solve the problem and why. Draw suitable diagram for the same. **[07]**

Q4. A training data set has been provided in fig2 for deciding if the weather is amenable to play Golf or Baseball. For partitioning the continuous attribute values to make them discrete, the following key has been mentioned below for your use. Calculate all the Entropy values for the attributes "Outlook" & "Wind". [07]

Temperature: Hot (H) 80 to 85, Medium (M) 70 to 75, Cold (C) 64 to 69.
Humidity: High (H) 81 to 96, Normal (N) 65 to 80.
Class: Yes (Y) play, No (N) no play

Day	Outlook	Temp	Humidity	wind	Play
1	sunny	85	85	week	no
2	sunny	80	90	strong	no
3	cloudy	83	78	week	yes
4	rainy	70	96	week	yes
5	rainy	68	80	week	yes
6	rainy	65	70	strong	no
7	cloudy	64	65	strong	yes
8	sunny	72	95	week	no
9	sunny	69	70	week	yes
10	rainy	75	80	week	yes
11	sunny	75	70	strong	yes
12	cloudy	72	90	strong	yes
13	cloudy	81	75	week	yes
14	rainy	71	85	strong	no

Figure 2

Q5. Write the formula for computing the probability of a sentence using chain rule. What are bigrams and if it is a first-order Markov model then what is the expression for computing the probability of a sentence? An experimental corpus and its corresponding Bigram table is provided. Corpus - (eos) You book a flight (eos) I read a book (eos) You read (eos)Calculate **P**((eos) you read a book (eos)) [07]

	(eos)	you	book	a	flight	I	read
(eos)	0	0.33	0	0	0	0.25	0
you	0	0	0.5	0	0	0	0.5
book	0.5	0	0	0.5	0	0	0
a	0	0	0.5	0	0.5	0	0
flight	1	0	0	0	0	0	0
I	0	0	0	0	0	0	1
read	0.5	0	0	0.5	0	0	0

Figure 3: Bigram Table