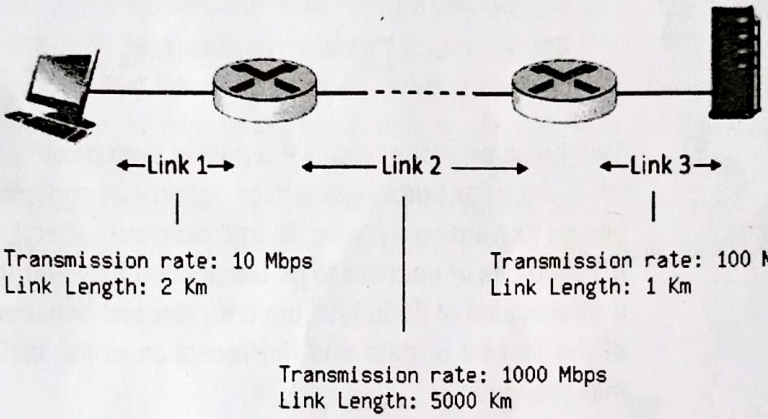
COLLEGE OF ENGINEERING, PUNE
(An Autonomous Institute of Govt. of Maharashtra)
Test-1 Computer Networks
Program: T.Y.B.Tech. (Computer Engineering)
Year: 2023-24 Semester I Date: 22/09/2023 Duration: 1 hr. Max. Marks: 20

Instructions:

1. Attempt all questions.
2. Figures to right indicate full marks.
3. Draw neat figures wherever required.
4. Assume suitable data, if necessary.

Marks

Q.1 A) Consider the figure below, with three links, each with the specified transmission rate and link length. Assume the length of a packet is 4000 bits. What is the transmission delay of link 1? **01**



B) I. RFC stands for **02**

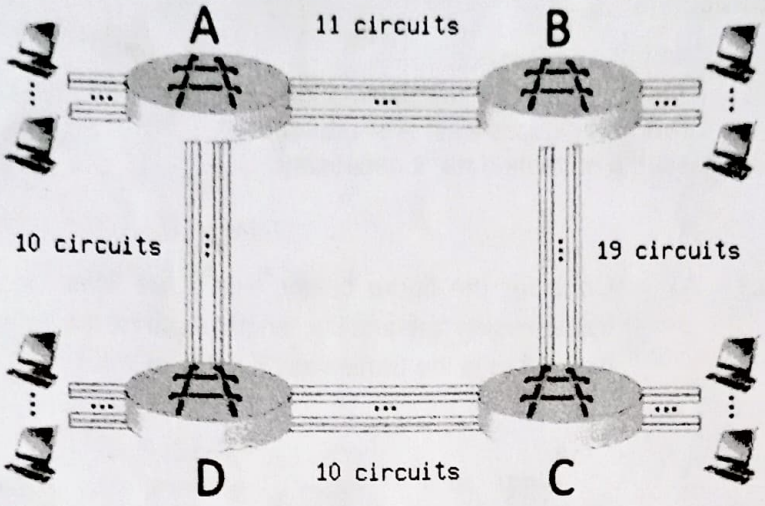
II. State True or False.

RFCs produced by the IANA.

C) Which one of the following statements is FALSE? **01**

I. Packet switching leads to better utilization of bandwidth resources than circuit switching.
II. Packet switching results in less variation in delay than circuit switching.
III. Packet switching requires more per packet processing than circuit switching
IV. Packet switching can lead to reordering unlike in circuit switching

D) Consider the circuit-switched network shown in the figure below, with circuit switches A, B, C, and D. Suppose there are 11 circuits between A and B, 19 circuits between B and C, 10 circuits between C and D, and 10 circuits between D and A. What is the maximum number of connections that can be ongoing in the network at any one time? **01**



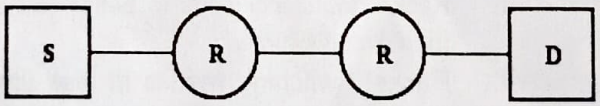
E) Two hosts are connected via a packet switch with 10^7 bits per second links. Each link has a propagation delay of 20 microseconds. The switch begins forwarding a packet 35 microseconds after it receives the same. If 10000 bits of data are to be transmitted between the two hosts using a packet size of 5000 bits, the time elapsed between the transmission of the first bit of data and the reception of the last bit of the data in microseconds is _____ μs. **02**

F) State True or False. **02**

i. In a peer to peer architecture, there is an always-on host, called the server, which services requests from many other hosts, called clients.

ii. Performance at a node is often measured not only in terms of delay, but also in terms of the probability of packet loss.

G) **01**



Assume that source S and destination D are connected through two intermediate routers labeled R. Determine how many times each packet has to visit the network layer and the data link layer during a transmission from S to D.

Q.2 A) The transport layer protocols used for real time multimedia, file transfer, DNS and email, respectively are **01**

i. TCP, UDP, UDP and TCP
ii. UDP, TCP, TCP and UDP
iii. UDP, TCP, UDP and TCP
iv. TCP, UDP, TCP and UDP

B) State True or False. **01**

Store-and-forward transmission means that the packet switch must receive the entire packet before it can begin to transmit the first bit of the packet onto the outbound link.

C) Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that n DNS servers are visited before your host receives the IP address from DNS, the successive visits incur an RTT of RTT1... RTT n. Further suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text. Let RTT0 denote the RTT between the local host and the server containing the object. Assuming zero transmission time of the object, how much time elapses from when the client clicks on the link until the client receives the object? **02**

D) **03**

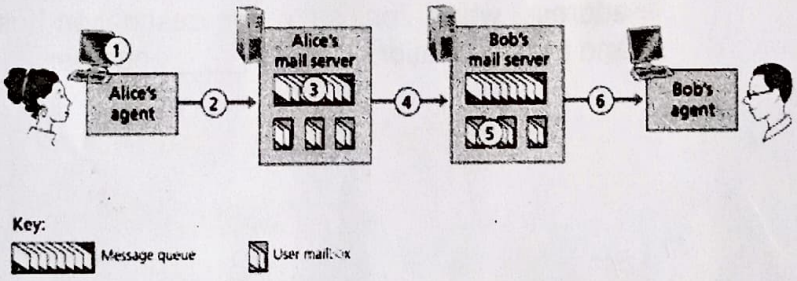
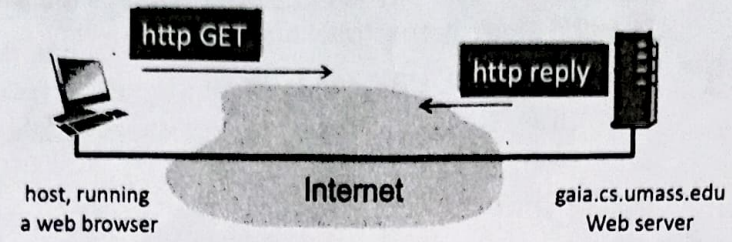


Figure ♦ Alice sends a message to Bob

Look at the scenario above, where Alice sends an email to Bob. For the questions below, assume both Bob's and Alice's user agents use the IMAP protocol.

i. At point 4 in the diagram, what protocol is being used?
ii. Does SMTP use TCP or UDP?
iii. Is SMTP a 'push' or 'pull' protocol?

E) **02**



Suppose the server-to-client HTTP RESPONSE message is the following:

HTTP/1.1 200 OK
Date: Mon, 18 Sep 2023 06:03:34 +0000
Server: Apache/2.2.3 (CentOS)
Last-Modified: Mon, 18 Sep 2023 06:18:54 +0000
ETag:17dc6-a5c-bf716880.
Content-Length: 53089
Keep-Alive: timeout=34, max=75
Connection: Keep-alive
Content-type: image/html

i) Was the server able to send the document successfully? Yes or No
ii) How big is the document in bytes?

F) The sending process attaches to the packet a destination address, which consists of the destination host's _____ address and the destination socket's _____ number. **01**

COLLEGE OF ENGINEERING, PUNE
(An Autonomous Institute of Govt. of Maharashtra)
Test-2 Computer Networks
Program: T.Y.B.Tech. (Computer Engineering)
Year: 2023-24 Semester V Date: 18/10/2023 Duration: 1 hr. Max. Marks: 20

Instructions:

1. Attempt all questions.
2. Figures to right indicate full marks
3. Draw neat figures wherever required.
4. Assume suitable data, if necessary.

			Marks
Q.1	A)	Consider a TCP connection in a state where there are no outstanding ACKs. The sender sends two segments back to back. The sequence numbers of the first and second segments are 230 and 290 respectively. The first segment was lost, but the second segment was received correctly by the receiver. Let X be the amount of data carried in the first segment (in bytes), and Y be the ACK number sent by the receiver. What are the values of X and Y (in that order)?	**03**
	B)	What is the value of the receiver window (rwnd) for host A if the receiver, host B, has a buffer size of 5000 bytes and 1000 bytes of received and unprocessed data?	**01**
	C)	What is the size of the window for host A if the value of rwnd is 3000 bytes and the value of cwnd is 3500 bytes?	**01**
	D)	Which of the following system calls results in the sending of SYN packets? i) socket ii) bind iii) listen iv) connect	**01**
	E)	In RDT protocols, i) Why did we need to introduce sequence numbers? ii) Why did we need to introduce timers?	**02**
	F)	Why does congestion occur in the network? What are the effects of congestion?	**02**

Q.2 A) Consider an IP packet with a length of 4500 bytes that includes a 20-byte IPv4 header and a 40-byte TCP header. The packet is forwarded to an IPv4 router that supports a Maximum Transmission Unit (MTU) of 600 bytes. Assume that the length of the IP header in all the outgoing fragments of this packet is 20 bytes. Assume that the fragmentation offset value stored in the first fragment is 0. The fragmentation offset value stored in the third fragment is _____ **02**

B) Find the class of following address. **01**
11000001 10000011 00011011 11111111

C) An organization is granted the block 130.56.0.0/16. The administrator wants to create 1024 subnets. **03**
i) Find the subnet mask.
ii) Find the number of addresses in each subnet.
iii) Find the first and last addresses in subnet 1024.

D) State True or False. **03**
i) The first address in the block can be found by setting the rightmost 32 - n bits to 0s.
ii) Addresses in class D are reserved for future use.
iii) Subnetting combines several networks into one large one.

E) Find the error, if any, in the following IPv4 addresses. **01**
i) 221.34.7.8.20
ii) 11100010.23.14.67

COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra.)

END Semester Examination

Programme: B.Tech.

Course Code: CT-21005

Branch: Computer Engineering

Duration: 3 Hrs.

Student PRN No.

Semester: V

Course Name: Computer Networks

Academic Year: 2023-24

Max Marks: 60

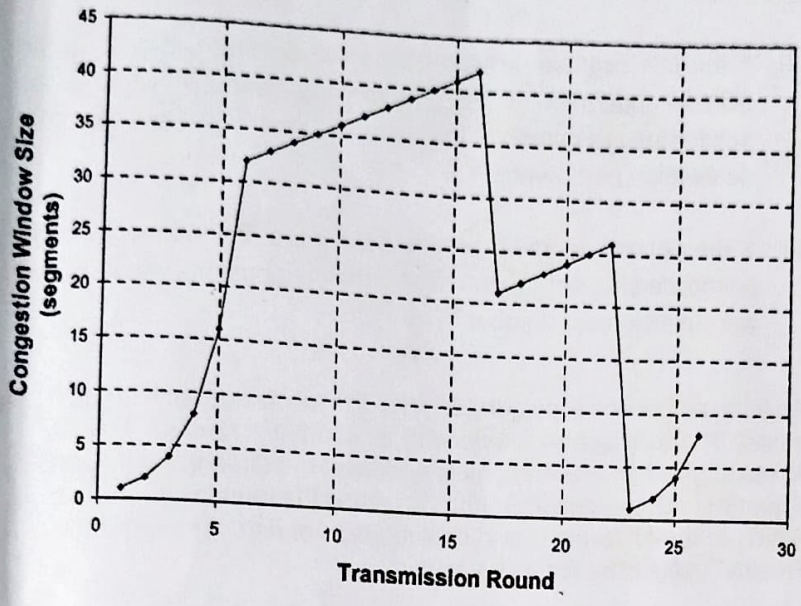
Instructions:

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of stationery, calculator etc. not allowed.
5. Write your PRN Number on Question Paper.

			Marks	CO	PO
Q 1	a	Suppose that a 2 Mbps link is being shared among a pool of users. Furthermore, assume that each user needs 200 kbps when transmitting. How many users can the link handle if we assume that circuit switching is used?	01	CO3	PO2
	b	Assume you want to retrieve a web page from cnlab.ce.coep.in. As your PC or the local DNS server do not have the IP address, then the root, TLD, and authoritative servers should all be visited to resolve the IP address. Now suppose that the roundtrip time between your PC and the local DNS server is 2 msec. Further, assume that the subsequent delay between the local DNS server and each of the Root, TLD, and authoritative servers is 10 msec and that each department has its own authoritative name server for its labs. How long would it take for your PC to obtain the IP address of the web server?	02	CO4	PO3
	c	State True or False. In circuit-switched networks, the resources needed along a path (buffers, link transmission rate) to provide for communication between the end systems are reserved for the duration of the communication session between the end systems.	01	CO4	PO3

	d	Consider two packet switches directly connected by a link of 5000km, propagation speed 2.5x10^8 m/s, and transmission rate 1Mbps. How long does it take to move the packet of length 1000 bytes from one packet switch to the other packet switch?	02	CO3	PO2
Q 2	a	State True or False I. FTP uses port number 22. II. A resource record is a four-tuple that contains the following fields: (Name, Value, Type, TTL), TTL is the time to live of the resource record; If Type=A, then Name is a hostname and Value is the MAC address for the hostname. III. Python program running in a host can create a TCP socket with the line `clientSocket = socket(AF_INET, SOCK_DGRAM)`	03	CO3, CO4	PO2, PO3
	b	From an ISP's point of view, POP3 and IMAP differ in an important way. POP3 users generally empty their mailboxes every day. IMAP users keep their mail on the server indefinitely. Imagine that you were called in to advise an ISP on which protocol it should support. What considerations would you bring up?	02	CO3, CO4	PO2, PO3
	c	Fill in the following blanks: I. The ports ranging from 0 to 1,023 are assigned and controlled by ICANN. These are the _____ ports. II. The ports ranging from 1,024 to 49,151 are called _____ ports. III. The ports ranging from 49,152 to 65,535 can be used as temporary or private port numbers. They are called the _____ ports.	03	CO3	PO2
Q 3	a	Assume that the timeout values for GBN and SR protocols are sufficiently long such that 5 consecutive data segments and their corresponding ACKs can be received (if not lost in the channel) by the receiving host (Host B) and the sending host (Host A) respectively. Suppose Host A sends 5 data segments to Host B, and the 2nd segment (sent from A) is lost. In the end, all 5 data segments have been correctly received by Host B. For GBN and SR protocols, how many segments has Host A sent in total and how many ACKs has Host B sent in total? Give justification for your answer.	03	CO5	PO4
	b	State True or False. The inclusion of the checksum in the TCP segment is optional.	01	CO3	PO2

c Consider the following plot of TCP window size as a function of time: **03** CO3, PO2, CO4 PO3



Assuming TCP Reno is the protocol experiencing the behavior shown above, answer the following questions.

I. Identify the intervals of time when TCP slow start is operating.
II. What is the initial value of ssthreshold at the first transmission round?
III. During what transmission round is the 70th segment sent?

d Host A and B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 144. Suppose that Host A then sends two segments to Host B back-to-back. The first and second segments contain 20 and 40 bytes of data, respectively. In the first segment, the sequence number is 145, source port number is 303, and the destination port number is 80. Host B sends an acknowledgement whenever it receives a segment form Host A. **03** CO3, PO2, CO4 PO3

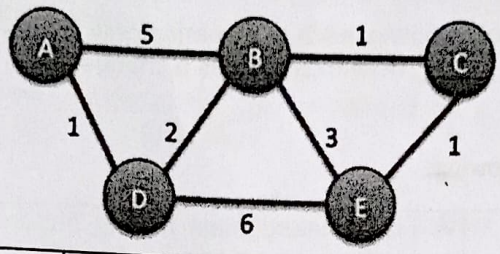
I. In the second segment sent from A to B, what are the sequence number, source port number, and destination port number?

II. If the first segment arrives before the second segment, in the acknowledgement of the first arriving segment, what is the acknowledge number, the source port number, and the destination port number?

III. If the second segment arrives before the first segment, in the acknowledgement of the first arriving segment, what is the acknowledgment number?

Q 4	a	An Internet Service Provider (ISP) has the following chunk of CIDR-based IP addresses available with it: 245.248.128.0/20. The ISP wants to give half of this chunk of addresses to Organization A, and a quarter to Organization B, while retaining the remaining with itself. Which of the following is a valid allocation of address to A and B? Provide justification for your answer. I. 245.248.136.0/21 and 245.248.128.0/22 II. 245.248.128.0/21 and 245.248.128.0/22 III. 245.248.132.0/22 and 245.248.132.0/21 IV. 245.248.136.0/24 and 245.248.132.0/21	02	CO2	PO3
	b	For each of the following addresses, state whether it is a legal, globally routable address or not. Provide justification for your answer: I. 10.7.123.14 II. 169.13.14.28 III. 245.74.37.126 IV. 113.56.263.47	04	CO2	PO3
Q 5	a	Assume a datagram of size 5000 bytes crosses 5 different networks segments on its way from sender to receiver. The smallest MTU of all network segments is 820 bytes. I. At which point in the network does the fragmentation occur? II. Show the length, ID, fragflag, and offset fields of the IP header of each fragment. III. At which location are the IP fragments reassembled? Explain your answer.	04	CO3, CO4	PO2, PO3
	b	Expand the address 0:15::1:12:1213 to its original.	01	CO4	PO3
	c	In classful addressing, the class of the address can be found by shifting the copy of the address ____ bits to the right.	01	CO2	PO3

Q 6 a Given the following network topology, fill in the table showing the step by-step operation of the link-state algorithm. **02** CO1, PO1, CO3, PO2, CO4 PO3



Step	N'	D(D),p(D)	D(B),p(B)	D(E),p(E)	D(C),p(C)
0					
1					
2					
3					

b Fill in the blanks: **02** CO1, PO1, CO3 PO2

I. To create a neighborhood relationship, a router running BGP sends a/an _____ message.

II. The routers running the BGP protocols exchange _____ messages regularly to tell each other that they are alive.

OR

b Consider the below scenarios where a BGP router receives multiple route updates for the same network. Referring to the BGP route selection rules, for each of the below scenarios: choose and state the route update that will be preferred by the BGP router to reach the advertised network. **02** CO1, PO1, CO3 PO2

Scenario 1:

A: 202.56.13/24, LOCAL-PREF: 10, AS-PATH: AS1, LEARNED FROM iBGP, IGP-COST: 10

B: 202.56.13/24, LOCAL-PREF: 10, AS-PATH: AS5, AS3, LEARNED FROM eBGP, IGP-COST: 1

C: 202.56.13/24, LOCAL-PREF: 9, AS-PATH: AS7, AS8, AS12, LEARNED FROM iBGP, IGP-COST: 5

Scenario 2:

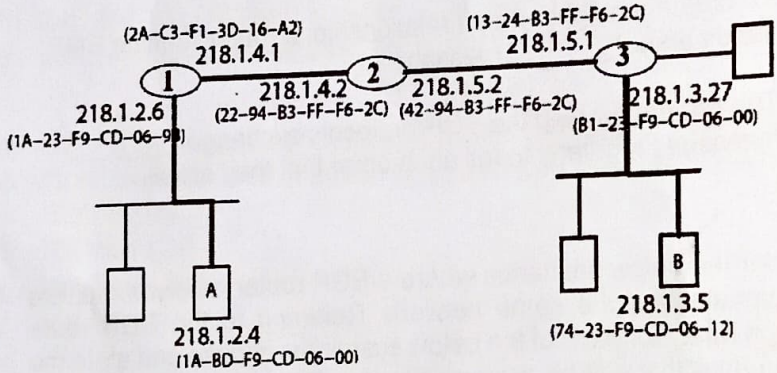
A: 102.64/10, LOCAL-PREF: 10, AS-PATH: AS1, MED: 100, LEARNED FROM iBGP, IGP-COST: 10

B: 102.64/10, LOCAL-PREF: 10, AS-PATH: AS1, MED: 90, LEARNED FROM eBGP, IGP-COST: 5

C: 102.64/10, LOCAL-PREF: 10, AS-PATH: AS1, MED: 90, LEARNED FROM iBGP, IGP-COST: 1

	c	In distance vector routing, each node periodically shares its routing table with _____ whenever there is a change.	01	CO3	PO2
	d	Match the following.	03	CO5	PO4

I.	RIP	A.	is an interdomain routing protocol using path vector routing.
II.	OSPF	B.	is an intradomain routing based on distance vector
III.	BGP	C.	is an intradomain routing protocol based on link state routing.

Q 7	a	Why is an ARP query sent within a broadcast frame? Why is an ARP response sent within a frame with a specific destination MAC address?	02	CO3	PO2
		OR			
	a		02	CO1, CO3	P01, P02

The figure above gives a topology of hosts and routers with the corresponding MAC and IP addresses. Assume that host A sends a message to host B, using the route indicated in thick line in the above figure.

For the network between router 2 and router 3, indicate the addresses that are used in the frame, including the source and destination IP addresses and the source and destination MAC addresses.

b	Two 16-bit words 1011 0101 1010 1000 and 0101 1001 0000 0101 are received, along with another 16-bit word, 1101 0001 0101 0001, which is the UDP checksum of the first two words. Will the receiver detect an error?	**02**	CO3	PO2
c	List the possible services that can be offered by a link-layer protocol. Discuss at least 2 services.	**04**	CO3	PO2
Q 8 a	Write appropriate answer in the table below with respect to 802.11 Frame Address Fields.	**04**	CO1, CO3	PO1, PO2

Function	To Distribution System	From Distribution System	Address 1	Address 2	Address 3	Address 4
IBSS	0	0				
From AP	0	1				
To AP	1	0				
Wireless DS	1	1				

b	Explain multipath propagation.	**02**	CO3	PO2
c	SSID stands for _____	**01**	CO3	PO2
d	State true or False. Hosts associated with a base station are often referred to as operating in infrastructure mode, since all traditional network services (e.g., address assignment and routing) are provided by the network to which a host is connected via the base station.	**01**	CO3	PO2

College of Engineering Pune

(An Autonomous Institute of Govt. of Maharashtra)

(MA21001) Probability and Statistics for Engineers

Program : T.Y.B.Tech.

(Branches: Computer, Electrical, Mechanical, E and TC and Instrumentation Engineering) Sem. V

Academic Year : 2023-24

Examination : End Semester Examination

Maximum Marks : 60

Date : /11/2023

Time : 180 Minutes

Student MIS Number : | | | | | | | | | | |

Instructions :

1. Write your MIS Number on Question Paper.
2. Writing anything on question paper and on statistical tables is not allowed.
3. Mobile phones and programmable calculators are strictly prohibited.
4. Exchange/Sharing of stationery, calculator etc. is not allowed.
5. Figures to the right indicate the course outcomes and full marks.
6. Unless otherwise mentioned symbols and notations have their usual standard meanings.
7. Any essential result, formula or theorem assumed for answering questions must be clearly stated.
8. Whenever necessary, use statistical tables provided by invigilator to do the statistical calculations.
9. Whenever necessary, write probability answers correct to four decimal places.

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1. A random variable X has mean 2 and standard deviation 0.5.
   Find $\mathrm{E}(2X-1)$ and $\mathrm{Var}(2X-2)$. [CO2, 2 marks]

2. Choose the correct option and justify your answer.
   Let $f : \mathbb{R} \to \mathbb{R}$ be defined by [CO3, 2 marks]

$$f(x) = \begin{cases} \dfrac{2^b}{c}\, x^4 e^{-2x}; & \text{if } 0 < x \\ 0 \quad\quad\quad\quad ; & \text{Elsewhere.} \end{cases}$$

Suppose f is a probability density function then values of a and b are given by

A. $b = 5$ and $c = 24$

B. $b = 6$ and $c = 10$

C. $b = 4$ and $c = 24$

C. $b = 5$ and $c = 6$

(P.T.O.)

3. Suppose that, on average, 1 person in 1000 makes a numerical error in preparing his or her income tax return. If 10,000 returns are selected at random and examined, find the probability that 6, 7 or 8 of them contain an error. Write appropriate R command. [CO3, 4 marks]

4. A research scientist reports that mice will live an average of 40 months when their diets are sharply restricted and enriched with vitamins and proteins. Assuming that the lifetime of such mice are normally distributed with a standard deviation of 6.3 months. Find the probability that the given mice will live (a) more than 32 months (b) less than 28 months (c) between 37 months to 49 months. [CO3, 4 marks]

5. In answering a question on a multiple choice test, a student either knows the answer or guesses it. Let p and $(1-p)$ be the probabilities that the student knows the answer and guesses it respectively. Assume that the probability of guessing the correct answer is $\frac{1}{m}$; where m is the number of multiple choice alternatives. What is the probability that a student knew the answer to a question given that the student answered it correctly?

[CO3, 3 marks]

6. A random sample of 100 recorded deaths in the state of Maharashtra during the past year showed an average life span of 71.8 years. Assuming a population standard deviation of 8.9 years, does this seem to indicate that the mean life span today is greater than 70 years? Use 0.05 level of significance. Write appropriate R command. Accept H_0 [CO3, 3 marks]

7. A manufacturer of car batteries claims that the life of the company's batteries is approximately normally distributed with a standard deviation equal to 0.9 year. If a random sample of 10 of these batteries has standard deviation of 1.2 years, do you think that $\sigma > 0.9$ years? Use a 0.05 level of significance. Write appropriate R command. reject H_0 [CO3, 5 marks]
$\chi^2 = 5.0625$

8. The body mass index (BMI) (x) and the systolic blood pressure (y) of 6 people were measured to study a cardiovascular disease. The data are as follows: [CO3, 4 marks]

x	26	23	27	28	24	25
y	170	150	160	175	155	150

The research hypothesis is that a high BMI relates to a high blood pressure. Estimate the linear model where blood pressure is the outcome and BMI is the covariate. Interpret the coefficients.

9. A die is tossed 180 times with the following results.

x	1	2	3	4	5	6
f	28	36	36	30	27	23

Is this a balanced die? Use a 0.01 level of significance and use Chi-square Goodness of fit test to test the hypothesis. Failed $p=4.466$ [CO3, 5 marks]

10. Dr. Aryan claims that over 40 percent of those who suffer from osteoarthritis receive measurable relief from an ingredient produced by a particular species of mussel found off the coast of New Zealand. To test this claim, the mussel extract is to be given to a group of 7 osteoarthritis patients. If 3 or more of the patients receive relief, we shall not reject the null hypothesis that $p = 0.4$; otherwise, we conclude that $p < 0.4$.

(a) Find significance level α. [CO3, 2 marks]

(b) Find probability of type II error β for $p = 0.3$ [CO3, 2 marks]

(c) If we increase sample size to 50 and the decision rule is given as follows: If 20 or more of the patients receive relief, we shall not reject the null hypothesis that $p = 0.4$; otherwise, we conclude that $p < 0.4$. Find (i) α and (ii) β for $p = 0.3$. [CO3, 4 marks]

(d) Is there any reduction in probability of type I and type II error by increasing sample size? Justify your answer. [CO4, 2 marks]

11. Consider the following data of x and y values. [CO3, 4 marks]

x	0	1	2	3	4	5	6
y	1	4	5	3	2	3	4

(a) Fit a polynomial to the above data $\mu_{Y|x} = \beta_0 + \beta_1 x + \beta_2 x^2$.

(b) Predict Y when $x = 2.5$.

12. Consider a random sample $X_i, i = 1, 2, \ldots n$ from a Bernoulli population, where $X_i = 1$ if event of interest occurs and $X_i = 0$ otherwise. Let p be the probability of occurrence of an event of interest. [CO4, 5 marks]

(a) Find the population mean.

(b) Prove that $\overline{X} = \frac{1}{n}\sum_{i=1}^{n} X_i$ is an unbiased estimator of the population mean.

(c) Find an unbiased estimator of the population variance.

13. The following data represents the time in minutes, that a patient has to wait during 12 visits to a doctors office before being seen by a doctor:

17	15	20	20	32	28
12	26	25	25	35	24

Use sign test at 0.05 level of significance to test the doctors claim that the median waiting time for her patients is not more than 20 minutes. [CO5, 5 marks]

14. Suppose that quality control charts are to be used on the process for manufacturing a certain engine part. Consider an in-control process with mean $\mu = 25$ and $\sigma = 1$. Suppose that the subgroups of size 5 are used with control limits $\mu + \frac{3\sigma}{\sqrt{n}}$, $\mu - \frac{3\sigma}{\sqrt{n}}$, and centerline at μ. Suppose that the shift occurs at the mean, and the new mean is $\mu = 26.5$. What is the average number of samples required (following the shift) to detect the out of control situation? What is the standard deviation of the run required? Take $\text{Var}(\overline{X}) = 1.5$. [CO5, 4 marks]

OR

A control chart is to be formed for a process in which laptops are produced. The inspection unit is one laptop and control chart for the number of defects is to be used. Preliminary data are recorded and 45 defects are found in 30 laptops. Obtain the control limits for the chart.

(P.T.O.)

OR

Consider Markov chain with three states, $S = \{1, 2, 3\}$ that has the transition matrix

$$P = \begin{pmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ \frac{1}{3} & 0 & \frac{2}{3} \\ \frac{1}{2} & \frac{1}{2} & 0 \end{pmatrix}.$$

(a) Draw the state transition diagram for this chain.

(b) If we know $P(X_1 = 1) = P(X_1 = 2) = \frac{1}{4}$, find $P(X_1 = 3, X_2 = 2, X_3 = 1)$.

OR

Consider the stochastic process so called 'random telegraph process'. This is a discrete-state continuous-time process $\{X(t)|; -\infty < t < \infty\}$ with the state space $\{-1, 1\}$. Assume that these two values are equally likely: $P[X(t) = -1] = \frac{1}{2} = P[X(t) = 1]$, $-\infty < t < \infty$.

(a) Find $\mu(t) = E(X(t))$. Is it independent of t?

(b) Find autocorrelation function $R(0) = E(X^2(t))$.

(c) Is this random telegraph process stationary in a wide-sense? Justify.

****

COLLEGE OF ENGINEERING PUNE

(An Autonomous Institute of Government of Maharashtra)

END Semester Examination

Programme: B.Tech

Semester: V

Course Code: 21001

Course Name: Database Management System

Branch: Computer Engineering

Academic Year: 2023-24

Duration: 3 hours

Max Marks: 60

Student PRN No.

Instructions:

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of stationery, calculator etc. not allowed.
5. Write your PRN Number on Question Paper.

			Marks	CO	PO
Q 1	A	What is a data model? List different data models available for database design.	2	1	1
	B	List and explain different responsibilities to be shouldered by Database System Administrator of the system.	4		
Q 2	A	Explain with example the referential integrity constraint.	4	2	1,2, 10,12
	B	Given the following relations vehicle (reg_id, make, colour) person(p_no, name, address) owner(p_no, reg_id) Write expressions in the relational algebra to answer the following queries:- a. List the reg_id of vehicles owned by John. (NOTE: Do not use rename operator, nested query and natural join, may use cartesian product if needed) b. List the names of persons who own only Maruti cars. (NOTE: Do not use rename operator and nested query, use only natural join) c. List all the red coloured vehicle.	6		
Q 3	A	Consider the SQL query: branch(branch name, branch city, assets) customer (customer name, customer street, customer city) loan (loan number, branch name, amount) borrower (customer name, loan number)	2	3	1, 2, 4, 5, 11

PTO

account (account number, branch name, balance)
depositor (customer name, account number)

Find the names of all branches with customers who have an account in the bank and who live in city "Harrison". Do not use "in", "with" , "not in" "except" and "nested query". If you want to use join , use only natural join or cartisian product.

B Compute the number of tuples obtained as result of the following SQL query. Why ? 2

Select A.ID from A where A.Age > All (select B.Age from B where B.name = 'Arun';

A		
ID	Name	Age
12	Arun	60
15	Shreya	24
99	Rohit	11

B		
ID	Name	Age
15	Shreya	24
25	Hari	40
98	Rohit	20
99	Rohit	11

C A relational database contains two tables Student and Performance as shown below: 2

The primary key of the Student is Roll_no. For the performance table, the columns Roll_no and Subject_code together form the primary key. Compute the number of rows obtained in the output of given SQL query :

SELECT S.Student_name, sum(P.Marks) FROM Student S, Performance P WHERE P.Marks > 84 GROUP BY S.Student_name;

Table: student	
Roll_no	Student_name
1	Amit
2	Priya
3	Vinit
4	Rohan
5	Smita

Table: Performance		
Roll_no	Subject_code	Marks
1	A	86
1	B	95
1	C	90
2	A	89
2	C	92
3	C	80

Q4 A Consider the weak enity set as payment = (payment_number, payment_date, payment_amount), where payment number is discriminator. Payment is dependent on loan (loan-number , amount), via a relationship set loan_payment. 4 2 1,2, 10,1 2

Design an E-R diagram for the same.

B Using the data in the given table (R) , Analyze if the following decomposition R1 and R2 of the schema *R (P,Q,R,S,T)* is a lossless-join decomposition or lossy decomposition. 4 4 3, 4, 8

R1= (*P*, *Q*, *R*)
R2 = (R, *S*, *T*).

P	Q	R	S	T
p1	q1	r1	s1	t1
p2	q2	r1	s2	t2

C. Let R (A, B, C, D) be a relational schema with the following functional dependencies: 6

F= {A → B, B → C, C → D and D → B }
The decomposition of R into R1=(A, B), R2=(B, C), R3=(B, D)

a. Compute the candidate key/s for R.
b. Analyze if the decomposition of R into R1,R2, R3 is lossless join decomposition.
c. Analyze if the decomposition of R into R1,R2, R3 and dependency preserving decomposition.

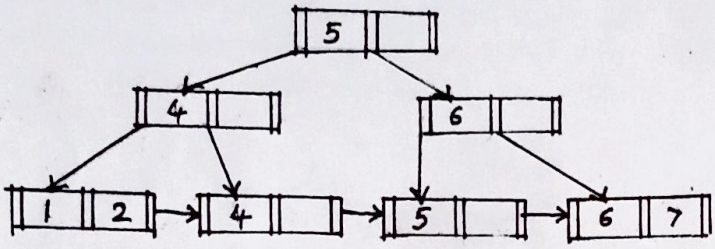
Q5 A Consider scenario where extendable hashing is used. Step by step show the mapping of elements 16, 4, 6, 22, 24, 10, 31, 7, 9, 20, 26 to the said structure. Start with global depth and local depth as 1 and bucket size is 3. 6 5 1,3

B For a B+ Tree of order n = 5 give the minimum and maximum number of values for the following table. NOTE: Draw this table in answer sheet. 4

Condition		Minimum-search key	Maximum-search key	Minimum pointers	Maximum pointers
Every node which is not a root or a leaf node		--	--		
leaf node (other than root node)				--	--
Special Case	Root (non-leaf node)	--	--		
	Root (leaf node)			--	--

C 2

Consider the B+ Tree of order n=3 given below. Draw the updated tree after the deletion of search key with value 5.



Q6 A Describe strict two phase locking (Strict 2PL)Protocol. Analyze if the given schedule is as per Strict 2PL. S- shared lock, X- exclusive lock 4 6 4, 7

S : T1(S(A)), T1(Read(A)), T2 (S(A)), T2(Read(A)), T2(X(B)), T2(Read(B)), T2(write(B)), T2-Commit, T1(X(C)) , T1(Read(C)) , T1(Write(C)), T1-Commit

B Analyze if the given schedule is recovarable or unrecovarable. 4

T1	T2
Read (A)	
Write (A)	
	Read (A)
	Write (A)
	Read (B)
	Write (B)
	Commit
Abort	

C Describe the phenomenon of starvation with reference to deadlock in database systems. Does the deadlock prevention schemes suffers from Starvation. 4

COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra.)

T-1 Examination

(MFG(IF)-22001) Fundamentals of Robotics)

Course: Fundamentals of Robotics Branch: TY BTech Computer Engg.

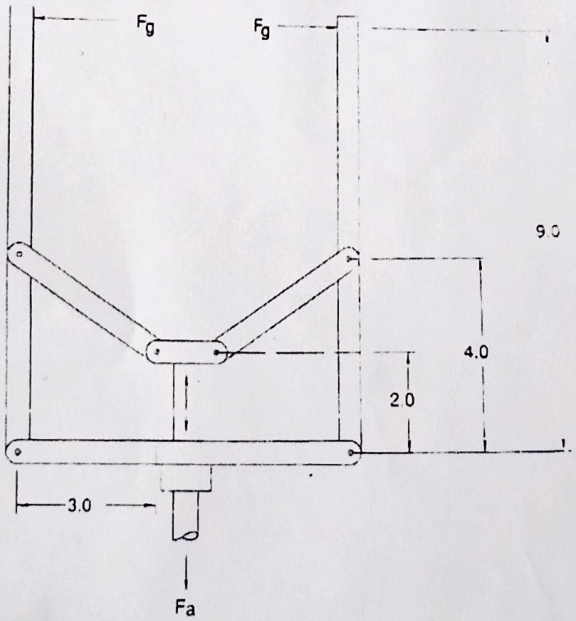
Academic Year: 2023-24 Max.Marks:20

Duration: 1 Hours Date: 23/09/2023

Instructions: **Student MIS No.** | | | | | | | | | |

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of stationery, calculator etc. not allowed.
5. Write your MIS Number on Question Paper

			Marks	CO	PO
Q 1	A]	How are robots specified? Give the classification of Robots and explain with sketches.	[5]	[CO1]	[PO1]
	B]	What are the applications of Industrial robots? Explain in detail.	[5]	[CO1]	[PO1]
Q 2	A]	How are grippers classified? Give classification of Mechanical Grippers and their applications.	[5]	[CO1]	[PO4]
	B]	Determine the actuating force Fa if gripping force is 10N.	[5]	[CO1]	[PO4]



COLLEGE OF ENGINEERING PUNE

T2 Examination

(MFG(IF)-22001) Fundamentals of Robotics

Course: TY B.Tech , Sem V

Branch: Computer Engineering

Academic Year:2023-2024

Max.Marks:20

Duration: 1 Hours

Date:19/10/2023

Student MIS No.

Q.1 Rewrite the question and choose the correct answer from the given choices. [Marks] [CO]

i) A rotary potentiometer of 10k Ohms being used as an angular position sensor of full-scale reading of 5V for 270 degrees will give: (1) [CO2]

a. 127 for 135 degrees with an Analog-Digital Converter (ADC) of 8 bits
b. 2.5V for 90 degrees
c. 255 for 0 degrees with ADC of 8 bits
d. 1.25V for 45 degrees

ii) A shaft encoder is to be used with a 50 mm radius tracking wheel to monitor linear displacement. If the encoder produces 256 pulses per revolution, what will be the number of pulses produced by a linear displacement of 200 mm? (1) [CO2]

a. 128 pulse
b. 1024 pulse
c. 64 pulse
d. 162 pulse

iii) Consider the following statements regarding the homogeneous coordinate transformations matrix: (1) [CO3]
(a) A homogeneous transformation matrix can be considered to consist of four sub-matrices.
(b) The upper left 3 x 3 sub-matrix represents the position vector.
(c) The upper right 3 x1 sub-matrix represents the rotation matrix.
(d) The lower left 1 x 3 sub-matrix represents perspective transformation.

Which of the above statements is correct?
a. (a) and (c)
b. (a) and (d)
c. (b) and (c)
d. (b) and (d)

iv) The following matrix represents rotation about? (1) [CO3]

$$R = \begin{bmatrix} cos\theta & sin\theta & 0 \\ -sin\theta & cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

a. X-axis
b. Z-axis
c. Y-axis
d. None of these

v) Which of these is not a D-H parameter? (1) [CO3]
a. Link Length a_i
b. Joint Offset d_i
c. Joint Twist q_i
d. Link Twist α_i

vi) Which one of the following is NOT contact sensor? (1) [CO2]

a) Proximity sensor
b) Micro-switch
c) Limit switch
d) Tactile sensor

vii) Which one of the following sensors is used to measure the magnitude of contact force? (1) [CO2]

a) Proximity sensor
b) Micro-switch
c) Limit switch
d) Tactile sensor

viii) What is the main purpose of using external sensors in robotics? (1) [CO2]

a) To operate the drive units
b) To collect information of the environment
c) To measure position and velocity
d) To measure contact force and moment

ix) Which one of the following sensors need not use magnetic material? (1) [CO2]

a) Hall-effect sensor
b) Inductive sensor
c) Linear Variable Differential Transformer (LVDT) sensor
d) Range sensor

x) What is the purpose of an absolute optical encoder? (1) [CO2]

a) To measure angular displacement from a known starting position
b) To measure linear displacement with respect to a reference position
c) To determine the direction of rotation
d) To measure force

Q.2 a) A video voltage signal is to be digitized by an A/D converter. The maximum voltage range is 12 volt. The A/D converter has a 8 bit capacity. Determine the number of quantizing levels, quantization level spacing and the quantization error. (2) [CO2]

b) Consider a forward transformation of two joint manipulator in which length of [redacted], L1 = 20 cm and [redacted], L2 = 10 cm , the angle θ1= 30° and angle θ2= 45°. Compute the coordinate position for the end of arm Pw. (2) [CO3]

c) A 8x8 image has intensity value as given below: (3) [CO2]
i) Construct a histogram and obtain the threshold value.
ii) Convert the picture into black and white image after smoothening binary image.

88	81	87	89	82	75	79	90
86	18	9	13	12	23	11	91
89	21	50	56	55	50	12	98
92	25	55	66	68	55	16	93
81	12	25	62	66	29	10	88
69	18	23	29	22	18	11	94
68	21	26	28	19	16	12	77
77	70	82	85	78	74	88	89

d) A Yasakawa robot has the link parameter table as follows: (3) [CO3]

i	α_{i-1}	a_{i-1}	di	θi
1	90	0	10	0
2	0	2	0	0
3	0	0	5	90

Using D-H parameters , Determine the origin of the gripper w.r.t. the base frame indicating all the intermediate steps.

COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra)

20

END Semester Examination

(MFG(IF)-22001) Fundamentals of Robotics

Course: B.Tech , Semester V Branch: Computer Engineering

Academic Year: 2023-2024 Max.Marks:60

Duration: 3 Hours Date: 26/11/2023

Instructions: **Student MIS No**

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of stationery, calculator etc. not allowed.
5. Write your MIS Number on Question Paper

		Marks	CO	PO
Q 1	a) Explain with sketch cylindrical configuration and SCARA configuration of robot manipulator.	[5]	[CO1]	[PO3]
	b) A robot having one sliding joint with a full range of 2 meter and robots control memory has a 12 bit storage capacity . Determine the control resolution and accuracy of robot. If control memory has 8 bit storage capacity , what is variation in control resolution and accuracy of robot?	[5]	[CO1]	[PO3]
Q 2	a) Discuss design considerations in selection of grippers.	[5]	[CO1]	[PO3]
	b) A vacuum gripper is to be designed to handle flat glass plate weighs 50 N . Two suction cups will be used and the diameter of suction cup is 5 cm . Determine negative pressure to life the plate.	[5]	[CO1]	[PO3]
Q 3	a) Explain the process of Sensing & digitization in Imaging Sensors	[5]	[CO2]	[PO3]
	b) A certain potentiometer is used as a feedback device to indicate position of the output link of a rotational robot joint. The excitation of potentiometer equals 6 volt and total wiper travel of the potentiometer is 240^0. The wiper arm is directly connected to the rotational joint so that a given rotation of the joint corresponds to an equal rotation of the wiper arm. i) determine the voltage constant of the potentiometer (Kp) and ii) the resulting output voltage of potentiometer if the robot joint is actuated to a certain angle causing the wiper position to be 60 degree .	[5]	[CO2]	[PO3]
	OR			
	b) A Video voltage signal is to be digitized by an A/D Converter. The Max. voltage range is +15 V. The A/D converter has 8 bit capacity. Determine the number of quantizing levels, the quantization level spacing and the quantization error.	[5]	[CO2]	[PO3]

Q4 a) Explain direct and inverse kinematics. [5] [CO3] [PO3]

b) In robot kinematics a vector is represented by V= 5i+6j+8k . Rotate the vector by 60 degree @ x axis and then use new position for further translation of the position by 10 units along Z axis. [5] [CO3] [PO3]

(OR)

b) The link parameters for the manipulator are given in table. Obtain the origin of the gripper w.r.t. base frame indicating all the intermediate steps. [5] [CO3] [PO3]

i	α_{i-1}	a_{i-1}	d_i	θ_i
1	90	0	0	0
2	0	0	5	45
3	60	0	0	0

Q5 a) A robot joint is required to reach from 20^0 to 60^0 in 3 sec. Obtain a cubic polynomial fit and sketch the trajectory for position, velocity and acceleration. [5] [CO4] [PO3]

b) A robot used for machine loading is priced Rs.4.5 Lakhs. The special gripper is attached costing Rs. 25000. The sensors cost Rs. 25000. There are no layout changes and robot will replace one operator with wage of Rs. 100/Hr including all fringe benefits. The operator works for 250 days a year 8 hours a day. No production increase or quality improvements are anticipated. What will be payback period for one shift operation and two shift operations? Assume running & maintenance cost is 15% of robot total cost fixed for one shift as well as for two shift operation. [5] [CO5] [PO3]

(OR)

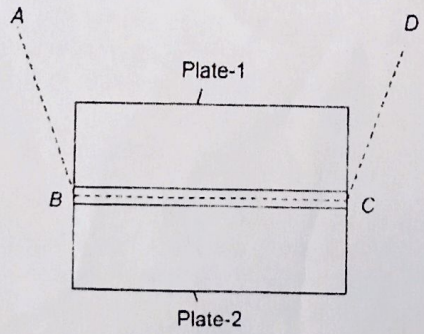
b) Explain the levels of safety in Robotic system. [5] [CO5] [PO4]

Q.6 a) Explain artificial intelligence in robotic system stating importance of expert system. [5] [CO6] [PO4]

b) Explain the commands used in robotic programming. [5] [CO6] [PO4]

(OR)

b) Two plates of 10 mm thickness are to be welded with square butt joint as shown in Fig. The welding is straight weld with triangular weave pattern with cycle distance 10mm and amplitude 5mm. The welding torch should start from position A, move to B, continue with continuous arc welding along BC in a straight line and then move to position D. Write a VAL program in world coordinates. The speed of welding is 10 mm/s , welding voltage is 50v and welding current 60 Amp. [5] [CO6] [PO4]



COLLEGE OF ENGINEERING, PUNE
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TEST - 1

Programme: B. Tech | **Semester: V**

Course Code: CT-21003 | **Course Name: Artificial Intelligence**

Branch: Computer Engineering | **Academic Year: 2023-2024**

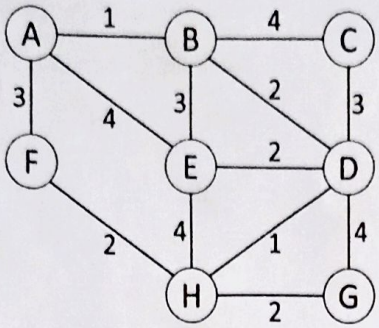
Duration: 1 Hr | **Max Marks: 20**

Student MIS No. | | | | | | | | | |

Instructions:

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of stationery, calculator etc. not allowed.
5. Write your PRN Number on Question Paper.

		Marks	CO	PO
Q 1	Consider the water jug problem, we are provided with two jugs: one has the capacity to hold 3 gallons of water, and the other has the capacity to hold 4 gallons of water. There is no other measuring equipment available, and the jugs also do not have any kind of markings on them. So, the agent's task is to fill the 4-gallon jug with 2 gallons of water using only these two jugs and no other material. Initially, both our jugs were empty. Formulate the above problem for the AI agent and derive the condition-action rule (mapping of percept sequence to action) to solve the problem.	[05]	2	2,6
Q 2	Give the Environment type and PEAS description for the following AI agent with supporting justification. 1. A Music Composer 2. An Aircraft Autolander 3. An Essay Evaluator	[05]	3,5	2,3, 4 & 6
Q 3	Consider the following given state space graph. The weighted edge represents the action cost between the two states. "A" is a start state, and "G" is a goal state. Trace the iteration of searching algorithms in a tabular format consisting of Open-List, Selected Current Node, Closed-List, Goal-Test, and Successor of Current Node. Also, find the resultant path and its cost.		2 & 6	2,3, 4,6 & 7



1. Apply DFS, BFS, and UCS by considering the states are explored in the anticlockwise direction starting from nine O'clock. The state already in the open list has a higher priority than the newly added state to break the tie between equal path-cost states. [05]
2. Apply Greedy Best First and A-Star by considering heuristic h_1.
   h_1: minimum cost path from a state to a goal state without revisiting the state. [04]
3. Comment on whether the heuristic h_1 is admissible and consistent and why. [1]

COLLEGE OF ENGINEERING, PUNE

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END Semester Examination

(CT-21003) Artificial Intelligence

Course: B.Tech, Semester V

Branch: Computer Engineering

Academic Year: 2023-2024

Max.Marks:60

Duration: 3 Hours

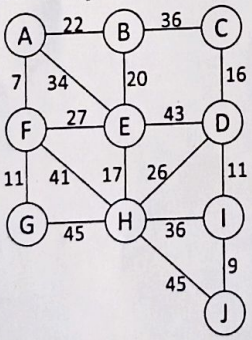
Date: 02/12/2023

Instructions:

Student MIS No. | | | | | | | | | |

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of stationery, calculator etc. not allowed.
5. Write your MIS Number on Question Paper

			Marks	CO	PO
Q 1	a	Compare the Simple Reflex Agent and Knowledge Base Agent with respect to their agent structure and function.	[6]	2	2,6
	b	Consider that the COEP campus can be modeled as an A × B grid. You and your friend are located in two random cells on the grid and want to meet in a cell anywhere on the grid. At each stage, you perform one action at a time (North, South, East, West, Stop). The task is to come up with a plan that puts the two of you together in the same cell somewhere at the same time, in as in as few time steps. 1. Which type of agent solves this problem? 2. How do you represent the state of this problem in the minimal form? 3. What is the size of the state space? 4. What is the branching factor? 5. What is the goal test? 6. Describe a non-trivial admissible heuristic for this problem.	[6]	3,5	2,3,4 & 6
Q 2		Consider the following given state space graph of cities and their location coordinates are A:[10, 25], B:[30, 35], C:[52, 64], D:[63, 76], E:[25, 55], F:[15, 30], G:[5, 35], H:[41, 62], I:[70, 84], J:[75, 92] on the X-Y plane. The weighted edge represents the distance between the two cities. Consider "A" as the start city and "J" as the Goal city. Trace the iteration of the following searching algorithm in a tabular format consisting of: Open-List, selected Current Node, Closed-List, Goal-Test, Successor of Current Node. Also, draw the search tree and provide the resultant path and path cost.		2 & 6	2,3,4,6 & 7



	a	Apply DFS, and BFS by considering nodes are explored in the anticlockwise direction starting from twelve O'clock. Node has a higher priority already present in fringe/open-list than newly added node to break the tie between equal path-cost nodes.	[6]		
	b	Apply Best First and A-Star search by using the Euclidian heuristic. Take the integer value of calculated Euclidian heuristic.	[6]		

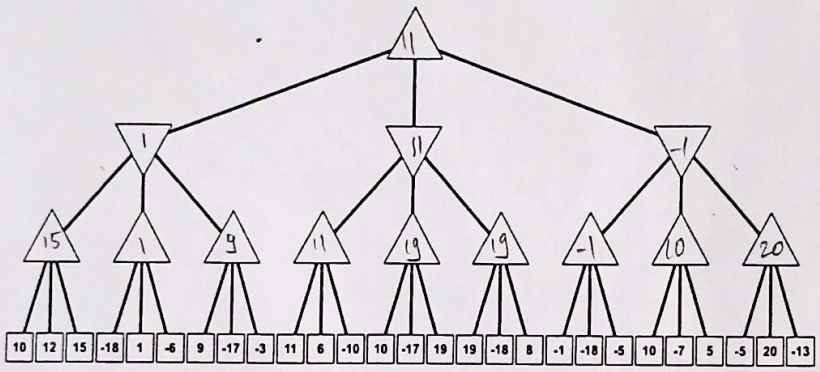
Q 3 **a** You have a task of TYCOM classes timetable scheduling that meet Mondays, Tuesday, and Wednesday for the following five courses and three faculties. 5 & 6 2,3,4,6 & 7

Course Code	Course Name	Class Time
C1	Fundamentals of Robotics	8:00-9:00am
C2	Computer Networks	8:30-9:30am
C3	Artificial Intelligence	9:00-10:00am
C4	Database Management System	9:00-10:00am
C5	Computer Organization	10:30-11:30am

Faculty	Can Teach Courses
X	1, 2, and 5
Y	3, 4, and 5
Z	1, 3, and 4

1. Formulate the above scheduling problem as a CSP. [1]
2. Draw the constraint graph for your CSP. [1]
3. Find the resultant domain by applying arc consistency algorithm. [4]

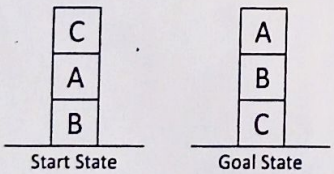
b Find the α, β values of each non pruning node of following game tree using AlphaBeta algorithm. Draw neat and clean game tree and show prune edges, and α, β values in front of each node. State the total number of pruned nodes explicitly. [6] 5 & 6 2,3,4,6 & 7



Q4 **a** Illustrate the types of learning and describe any two type with examples. [4] 6 2,3,4 & 7

b Consider the following statements give in knowledge base: [6] 5 & 6 2,3,4,6 & 7
"If the unicorn is mythical, then it is immortal, but if it is not mythical, then it is a mortal mammal. If the unicorn is either immortal or a mammal, then it is horned. The unicorn is magical if it is horned."
Prove that unicorns are magical using resolution refutation in predicate logic.

Q5 **a** [6] 6 2,3,4 & 7



Recall the block world environment representation in predicate logic and STRIP planning. Consider the above state of block world, produce the plan to achieve a goal from the given start state using goal stack method.

b Draw and explain the architecture of artificial neural networks. Design XNOR and NOR logic gates using McCulloch-Pitts neural network. Draw a neat and tidy design for each network and label all weights and bias values for each neuron. Write the calculation for each output of the logic gate. [6] 6 2,3,4 & 7

COLLEGE OF ENGINEERING PUNE

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END Semester Examination

Programme: B. Tech. | **Semester: V**

Course Code: CT 21007 | **Course Name: Computer Organization**

Branch: Computer Engineering | **Academic Year: 2023-24**

Duration: 3 Hrs. | **Max Marks: 60**

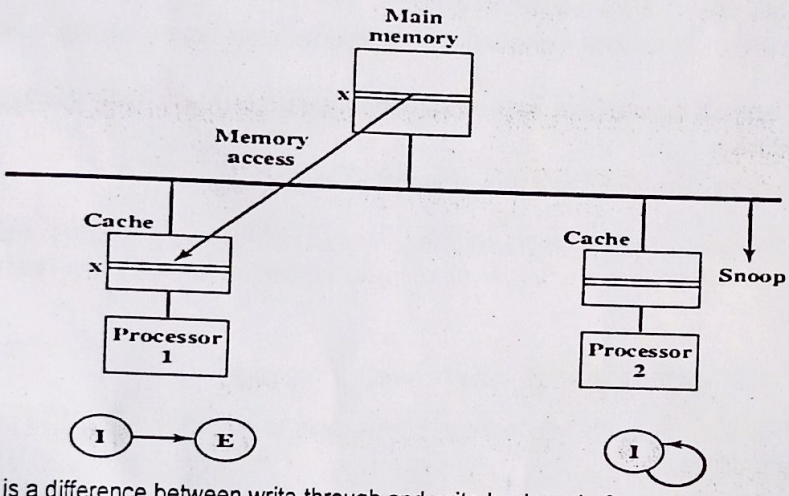
Student PRN No.

Instructions:

1. **Figures to the right indicate the full marks.**
2. **Mobile phones and programmable calculators are strictly prohibited.**
3. **Writing anything on question paper is not allowed.**
4. **Exchange/Sharing of stationery, calculator etc. not allowed.**
5. **Write your PRN Number on Question Paper.**

			Marks	CO	PO
Q 1	a	Consider two different implementations of the same instruction set architecture. The instructions can be divided into four classes according to their CPI (classes A, B, C, and D). P1 with a clock rate of 2.5 GHz and CPIs of 1, 2, 3, and 3, and P2 with a clock rate of 3 GHz and CPIs of 2, 2, 2, and 2. Given a program with a dynamic instruction count of 1.0E6 instructions divided into classes as follows: 10% class A, 20% class B, 50% class C, and 20% class D, which is faster: P1 or P2? **a.** What is the CPI for each implementation? **b.** Find the clock cycles required in both cases.	4	1	1, 2, 4, 5, 8, 10, 12
	b	Discuss datapath in processors. State all the elements that are used in RISC-V datapath implementation.	4	1	
	c	Differentiate between hardwired & microprogrammed control units.	4	1	
Q 2	a	Explain the working style of Booth's algorithm. Given x = 0101 and y = 1010 in twos complement notation (i. e. x = 5, y = - 6), compute the product p = x * y with Booth's algorithm. **OR** Explain the working of Booth's algorithm with recoding technique.	4	2	1, 2, 4, 5, 8, 10, 12
	b	Divide -145 by 13 in binary twos complement notation, using 12-bit words. Use the restoring algorithm.	4	2	
	c	Give the IEEE 32-bit floating-point format. Express the following numbers in IEEE 32-bit floating-point format: **a.** 384 **b.** 1/16 **c.** -1/32	4	2	
Q 3	a	**1.** What decimal number does this single precision float represent? 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 1 1 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 **2.** Add the numbers 0.5_{10} and -0.4375_{10} in binary using floating point addition algorithm.	4	2, 3	1, 2, 4, 5, 8,

	b	**1.** Assume:
		- A processor has a direct mapped cache, - Data words are 8 bits long (*i. e.* 1 byte)
		- Data addresses are to the word, - A physical address is 20 bits long
		- The tag is 11 bits, - Each block holds 16 bytes of data
		How many blocks are in this cache? Represent with appropriate diagram.
		2. A two-way set-associative cache has lines of 16 bytes and a total size of 8 kbytes. The 64-Mbyte main memory is byte addressable. Show the format of main memory addresses.
		3. What are the differences among direct mapping, associative mapping, and set-associative mapping?
		4. Consider the following code:
		for (i = 0; i<20; i++)
		for (j = 0; j <10; j++)
		a[i] = a[i]* j;
		a. Give one example of the spatial locality in the code.
		b. Give one example of the temporal locality in the code.
			4	3	10, 12

	c	**1.** Consider a situation in which two processors in an SMP configuration, over time, require access to the same line of data from main memory. Both processors have a cache and use the MESI protocol. Initially, both caches have an invalid copy of the line. Figure given below depicts the consequence of a read of line x by Processor P1. If this is the start of a sequence of accesses, draw the subsequent figures for the following sequence: 1. P2 reads x. 2. P1 writes to x (for clarity, label the line in P1's cache x'). 3. P1 writes to x (label the line in P1's cache x"). 4. P2 reads x.  **2.** What is a difference between write-through and write-back cache?	4	3	
Q 4	a	**a.** Describe exactly how, in general, a virtual address generated by the CPU is translated into a physical main memory address with appropriate diagram. **b.** What physical address, if any, would each of the following virtual addresses correspond to? (Do not try to handle any page faults, if any.) (i) 1052 (ii) 2221 (iii) 5499	4	3	1, 2, 4, 5, 8,

	b	Consider a disk that rotates at 3600 rpm. The seek time to move the head between adjacent tracks is 2 ms. There are 32 sectors per track, which are stored in linear order from sector 0 through sector 31. The head sees the sectors in ascending order. Assume the read/write head is positioned at the start of sector 1 on track 8. There is a main memory buffer large enough to hold an entire track. Data is transferred between disk locations by reading from the source track into the main memory buffer and then writing the date from the buffer to the target track. a. How long will it take to transfer sector 1 on track 8 to sector 1 on track 9? b. How long will it take to transfer all the sectors of track 8 to the corresponding sectors of track 9? **OR** Discuss the different levels of RAID with appropriate diagrams and differentiate with respect to performance.	4	4	10, 12
	c	**1.** What is importance of SDRAM? Why systems prefer DDR option in RAM? **2.** Assume that the 8-bit input word is 00111001, with data bit D1 in the rightmost position. Calculate the check bits in normal way. Assume third bit is with error. Calculate the check bits again and show the single error correction.	4	4	
Q 5	a	Show the possible dependences among the following instructions. I1: sub r2,r3,r4 /* r2 ← r3 − r4 */ I2: sub r4,r2,r3 /* r4 ← r2 − r3 */ I3: sw r2,100(r1) /* M[r1 + 100] ← r2 */ I4: sub r3,r4,r2 /* r3 ← r4 − r2 */ Discuss different types of hazards in detail. Explain techniques to handle RAW.	4	5	1, 2, 4, 5, 8, 10, 12
	b	What is bus arbitration and why do we need it? Discuss the characteristics of Universal Serial Bus (USB). **OR** Differentiate between RISC and CISC style processors with characteristics and appropriate examples.	4	5	
	c	**1.** Discuss a typical SMP organization with features. **2.** Which are the features and applicabilities of a cluster?	4	5	

COEP TECHNOLOGICAL UNIVERSITY (COEP Tech)
A Unitary Technological University of Government of Maharashtra
(Formerly College of Engineering Pune (COEP))

Test1 Examination

Programme: Honors in Data Science **Semester: II**

Course Name: (CT(HO)-21001) Making Sense of Data

Branch: Honors Third Year

Duration: 1 Hr **Max Marks: 20**

Student PRN No.

Instructions:

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of stationery, calculator etc. not allowed.
5. Write your PRN Number on Question Paper.

Que No.	Question	CO	PO	Marks
Q 1 a)	Differentiate data Analysis, data analytics and data science? Enlist the tools of data analytics	1	1	4
b)	Explain the following terms: Data distribution Bernoulli distribution Poison distribution Binomial distribution Geometric distribution	2,4	2,3	6
Q2. a)	Discuss the steps (lifecycle) of data analytics application with the example	3	4	4
b)	How to describe dataset with the term's observations and variables? Discuss different types of variables?	1,4	2,3	6

COLLEGE OF ENGINEERING PUNE

(An Autonomous Institute of Government of Maharashtra.)

End Sem Examination

Programme: Honors in Data Science **Semester:** V

Course Code:(CT(HO)-21001)Making Sense of Data

Branch: TY COMPUTER **AcademicYear:2023-24**

Duration:3Hr **MaxMarks:60**

Student PRN

No.Instructions:

1. Writing anything on question paper is not allowed.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Exchange/Sharing of stationery, calculator etc. not allowed.
4. Write your PRN Number on Question Paper.

			Marks	CO	PO
Q1	a	Distinguish types of machine learning with suitable examples	5	1	1
	b	Write a program in python to draw pie chart?	5	2,4	2,3
	c	Describe steps involved in data visualization	5	3	4
Q2	a	Differentiate classification and regression techniques with suitable examples	5	1,4	2,3
	b	Describe scatter plot in details? What data types work best in scatter plots?	5	1,2	1,2
	c	Analyze what kinds of information are often shown by box plots? Why?	5	2,4	2,3
Q.3	a	How to Plot Histogram in Python? Explain with suitable example	5	2,4	2,3
	b	Describe different data preprocessing methods with suitable example	5	1,4	2,3
	c	What are the benefits of line plots over bar charts?	5	1,4	2,3
Q4 Fill in the blanks	1	_____ type of machine learning is used for predicting continuous values?	1	3	1,4
	2	The Pandas method used to group data in a DataFrame is _____.	1	2	1,4
	3	The Pandas method used to drop rows with missing values is _____.	1	3	1,4
	4	Machine learning is a subset of _____	1	2	1,4
	5	_____the type of learning in which labeled training data is used.	1	2	1,4
	6	_____parameter in Matplotlib is used to specify the edge color of markers in a plot.	1	1	1,4
	7	_____parameter is used to set the size of markers in a plot.	1	1	1,4

	8	_____method in scikit-learn is used to fit a linear regression model.	1	1	1,4
	9	_____library in Python is commonly used for implementing linear regression.	1	1	1,4
Q4 True or False	1	The absence of a specified marker size will result in the default marker size being used for the plot. A) True B) False	1	4	1,4
	2	Is Matplotlib open-source and free? A) True B) False	1	4	1,4
	3	'markersize' parameter can be used to adjust the width of lines in a plot. A) True B) False	1	4	1,4
	4	Linear regression can handle categorical data efficiently without preprocessing. A) True B) False	1	4	1,4
	5	In linear regression, multicollinearity occurs when independent variables are highly correlated with each other. A) True B) False	1	4	1,4
	6	'mfc' and 'mec' are parameters specifically related to marker appearance in a plot. A) True B) False	1	4	1,4