MSB

TIME: 3.30 P.M.- 4.30P.M.   DATE: 29.08.2024   MAX. MARKS: 20

ANSWER ALL QUESTIONS

1.   What is a Peer-to-Peer Process? What are its functions?   (2)

2.   How messages are transmitted in i) connection-oriented service and ii) connectionless service?   (3)

3.   What are the layers of TCP/IP? What are the functions of each layer? What is the fundamental unit of the message at each layer?   (4)

4.   Why mesh topology is robust in nature?   (2)

5.   Compare: Transparent Learning Bridge and Transparent Spanning Tree Bridge.   (3)

6.   Consider the following bit pattern: 1100110111100101

Show the signal that is sent using a diagram, i) If the bit rate is 16 bit/sec and baud rate is 8 baud/ sec and ii) if the bit rate is 8 bit/sec and baud rate is 4 baud/sec.   (2)

7.   Consider the following bit pattern:

1 0 1 0 0 0 0 0 1 1 1 1 0 0 1 1 0 1

Show the NRZ, Manchester, NRZ-I and AMI encoding for the bit pattern.   (4)

******

MSB

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI-620015
B.TECH. DEGREE (FIFTH SEMESTER)
BRANCH: COMPUTER SCIENCE AND ENGINEERING
ASSESSMENT 3
SUB.CODE & TITLE: CSPC53 COMPUTER NETWORKS

TIME: 10.30 A.M.- 11.30 A.M.   DATE: 14.10.2024   MAX. MARKS: 20

ANSWER ALL QUESTIONS

1. What is block coding? What are the steps involved in Block Coding? How it is represented? Give an example. (3)

2. What are the components of PCM encoder? Explain the functions of each component. (3)

3. Explain the implementation of BASK and BFSK using diagrams. (3)

4. Using diagrams, describe the following:
   i)   Sender sending one frame to receiver and receiver sending an ack frame.
   ii)   Sender sending a set of frames to receiver and receiver sending a set of frames with ack. Also demonstrate Go Back N and Selective Repeat techniques. (3)

5. Explain the role of exponential back-off algorithm in random access protocols. (2)

6. Why would the token-ring protocol be inefficient if a LAN had a very large perimeter? (2)

7. Describe how packet loss can occur at routers. (2)

8. What is the use of the following fields in IP Header?
   i)   TTL
   ii)   Options field (2)

******

M SB

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI-620015
B.TECH. DEGREE (FIFTH SEMESTER)
BRANCH: COMPUTER SCIENCE AND ENGINEERING
COMPENSATION ASSESSMENT
SUB.CODE & TITLE: CSPC53 COMPUTER NETWORKS

TIME: 11.00 A.M.- 12 NOON.   DATE: 08.11.2024   MAX. MARKS: 20

ANSWER ALL QUESTIONS

1. Compare:

    i) Data Link layer and transport Layer

    ii) Virtual circuit and Datagram

    iii) Half Duplex and Full Duplex   (3)

2. Why protocols are needed in Networking?   (2)

3. Why statistical multiplexer is more efficient than synchronous multiplexer?   (2)

4. Draw the frame format of IEEE 802.3 and describe the role of each field.   (3)

5. Consider the following message and generator polynomial:

    $M = 1100101011000101$

    $G = 1010$

  Demonstrate the working of CRC.   (3)

6. Explain the various types of transmission impairments.   (3)

7. Explain the working of Pure ALOHA and Slotted ALOHA.   (4)

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MSB

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI-620015
B.TECH. DEGREE FIFTH SEMESTER
END SEMESTER EXAMINATION
SPECIALIZATION: COMPUTER SCIENCE & ENGINEERING
SUB.CODE & TITLE: CSPC53 COMPUTER NETWORKS

TIME: 02.00 PM – 05.00 PM   DATE: 20.11.2024   MAX. MARKS: 100

ANSWER ALL QUESTIONS

1a. What are Wireless Access Points? Using a diagram, explain how it connects both wired and wireless networks.

b. What is the difference between a Port address, IP address and MAC address? What are the address requirements in TCP/IP protocol stack? Explain.

c. Explain the layering principle using a diagram. What are the design issues related to each layer of Network software?   (6, 7, 7)

2a. Using examples, explain the use of Multilevel schemes for line coding.

b. Explain how digital signals are transmitted using baseband and broadband transmissions.

c. What is spread spectrum? How is it different from multiplexing? What are its types? Briefly explain.   (6, 7, 7)

3a. Find the Hamming distance between 0110011001 and 1100111011. Explain the use of Hamming distance in error control using an example.

b. Explain the working of Stop-and- wait protocol ARQ protocol. How is it different from Go-Back N ARQ protocol?

c. Explain the working of Slotted ALOHA. Also explain how it can be modified for Low channel utilization.   (7, 6, 7)

1

4a. Consider the following network. Suppose Node A transmits a packet P1 and if the routing algorithm used is Flooding, how many P1 packets will arrive at Node B, C and D?
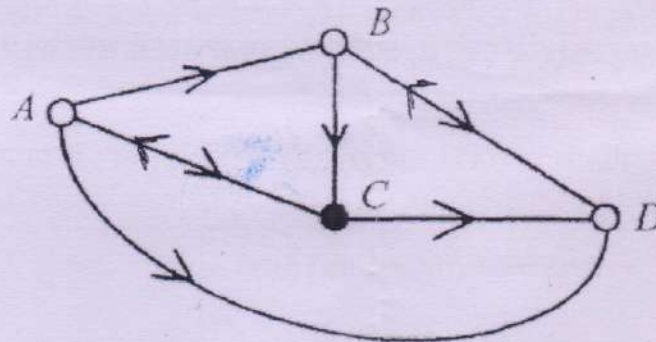
b. Consider sending an IP datagram of size 1420 bytes (including 20 bytes of IP header) from a sender to a receiver over a path of two links with a router between them. The first link (sender to router) has an MTU (Maximum Transmission Unit) size of 542 bytes, while the second link (router to receiver) has an MTU size of 360 bytes. What is the number of fragments that would be delivered at the receiver?

c. Supposing two blocks of addresses are granted to an organization and if one of address of the first block is 205.16.39/28 and one address of second block is 25.34.12.56/16, find out the first address and last address in each block.

205.10.16.39

(6, 7, 7)

5a. What are the different ways of establishing and terminating a connection in TCP? Explain.

b. Describe the salient features of the following Application layer protocols.

   i) HTTP

   ii) SMTP

(10, 10)

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RAJESHWARI

NATIONAL INSTITUTE OF TECHNOLOGY,
TIRUCHIRAPPALLI – 620015
### DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.Tech (CSE) - Cycle Test 1 – July - December 2024

CSPC54– Introduction to Artificial Intelligence and Machine learning

Semester: V, Section B

Curriculum: NITTUGCSE21

Date of Exam: 28th August 2024

Max Marks: 15

Time: 1 hour

1. Give PEAS for the following activities: (CO2) (2)
   a. Practising Tennis against a wall
   b. Amazon's recommendation system.

2. Give a complete problem formulation for the following problem so that the implementation is possible. "You have three jugs, measuring 12 gallons, 8 gallons and 3 gallons and a water faucet. You can fill the jugs up or empty them out from one to another or onto the ground. You need to measure out exactly one gallon". (CO2) (2)

3. Consider a state space where the start state is number 1 and each state "k" has two successors: numbers 2k and 2k+1.
   a. Draw the portion of the state space for states 1 to 15. (3)
   b. Suppose the goal state is 11. List the order in which the nodes will be visited for BFS, Depth-limited search with limit 3, and iterative deepening search.
   c. How well would bidirectional search work on this problem? What is the branching factor in each direction of the search?

4. Consider the search problem represented in the following figure, where S is the start node and G is the goal node. Consider the following heuristic function: (CO1) (3)

State	h₁	h₂
S	5	4
A	3	2
B	6	6
C	2	1
D	3	3
G	0	0

- Given this information, run A* search for both the heuristics and determine the path to reach from S to G.
- Are the heuristic functions h_1 and h_2 admissible and consistent? Explain why or why not.
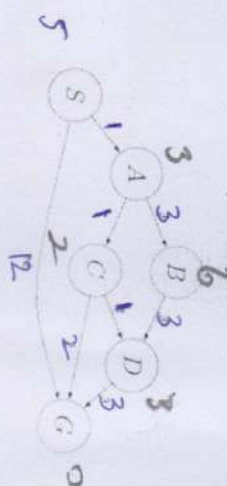
5. Determine the values of each node by applying minimax procedure. Show the results after applying α-β pruning. (CO1) (3)

6. Consider the following dataset. Apply Naïve Bayes algorithm and predict that if a fruit has the following properties which type of fruit it is, Fruit = {Yellow, sweet, Long}. What is the issue in this dataset? How do you eliminate? (CO4) (2)

Fruit	Yellow	Sweet	Long	Total
Mango	350	450	0	650 → 800
Banana	400	300	350	400 → 1050
Others	50	100	50	150 → 200
Total	800	850	400	1200 → 2050

--- Best Wishes ---

RAJESHWARI

Semester: V

Max Marks: 15

Curriculum: NITTUGCSE21

Time: 1 hour

Date of Exam: 14th October 2024

1. Write FOL statements for the following scenario and verify whether the conclusion is true? (2)

(CO3)

   • Anyone who owns a rabbit hates anything that chases any rabbit.

   • Any student who does not study does not pass

2. Consider the following Wumpus world environment where the terms S (stench), B (Breeze) Pit, Gold and Wum are as discussed in the class. Consider the Hunter is at position (1,1). Deduce the path that the Hunter would take to grab gold. Justify the path using propositional logic statement substantiation.

(CO3)

(3)

Wum	S , B	Pit	B
S	B	B	Gold
B	Pit	B	B
Hun	B	B	Pit

(rows labelled 4, 3, 2, 1 from top to bottom; columns 1, 2, 3, 4)

3. Construct a Decision tree model that evaluates the following expression: (3)

(CO4)

$$y = \sim x_1 \wedge x_2 \mid x_3$$

4. Carry out K-medoids clustering for the following data points and prove the effectiveness of your clustering. A(2, 3), B (7, 2), C (1, 1), D (8, 5), E (3, 6), F (9, 7) (3)

(CO5)

5. Explain the updating of weight method in an ANN model using necessary equations. (2)

(CO4)

6. What are the issues in Decision Tree model and how are they addressed? (2)

(CO4)

--- Best Wishes ---

RAJESHWARI

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI – 620015
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.Tech (CSE) - Compensation Test – July - December 2024
CSPC54– Introduction to Artificial Intelligence and Machine learning

Semester: V, Section B
Curriculum: NITTUGCSE21
Date of Exam: 5th October 2024

Max Marks: 15
Time: 1 hour

1. Construct a Naïve Bayes model for the following data and predict the risk class of a car driver based on the following attributes: Time 1- 2 year, Female, Urban. (2)

Time in years	Gender	Area	Risk
1-2	M	Urban	LOW
2-7	M	Rural	HIGH
>7	F	Rural	LOW
1-2	F	Rural	HIGH
>7	M	Rural	HIGH
1-2	M	Rural	HIGH
2-7	F	Urban	LOW
2-7	M	Urban	LOW

2. Cluster the following points using k-means clustering and show the clusters. Show the no. of epochs as well. A1= (12,18, 15), A2=(20,15, 21), A3=(16, 14, 21), A4=(19, 8, 12), A5=(17,15, 1), A6=(16, 4, 12), A7=(11, 2, 14), A8=(14, 9, 12). The seed points are A2, A5. (3)

3. Explain the A* algorithm use that solve the following TSP problem and compare their performances with Greedy Best First Search. Assume a Heuristic function. (4)
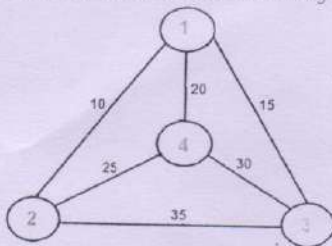
4. Define PEAS for a BABYSITTER and CRICKET UMPIRE. What type of agent will you use it for designing these two agents? Describe diagrammatically the representation of the various actions and percept that these agents need to use for carrying out their job. (3)

5. Give a complete problem formulation for the following so that it is precise enough to be implemented: (3)

" A 3-foot-tall monkey is in a room where some bananas are suspended from the 8-foot ceiling. He would like to get the bananas. The room contains two stackable, movable, climbable 3-foot-high crates".

--- Best Wishes ---

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI – 620015
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.Tech (CSE) – End Semester Examination – July - December 2024
CSPC54– Introduction to Artificial Intelligence and Machine learning
Semester: V, Section: B
Curriculum: NITTUGCSE21
Max Marks: 80
Time: 3 hours
Date of Exam: 22nd November 2024

1. a. i. Given an architecture with 'n' bits of storage, how many different possible agent programs are there? Give example.
ii. Given a fixed machine architecture, does each agent program implement exactly one agent function. Justify. (CO1) (4)

b. Solve the following blocks world problem using DFS and compare its performance with BFS / Bidirectional Search. (CO1) (3 + 3)

A	D
D	C
C	B
B	A
Initial State	Goal State

c. Consider the problem of solving two 8-puzzles (CO1) (1 + 1 + 2 +2)
   i. Give a complete problem formulation.
   ii. How large is the reachable state space? Give an exact numerical expression.
   iii. Suppose we make the problem adversarial as follows: The two players take turns moving; a coin is flipped to determine the puzzle on which to make a move in that turn; and the winner is the first to solve one puzzle. Whih algorithm can be used to choose a move in this setting?
   iv. Give an informal proof that someone will eventually win if both play perfectly.

2. a. Convert the following set of sentences to clausal form. (CO2) (6)
   * $A \Leftrightarrow (B \vee E)$
   * $E \Rightarrow D$
   * $C \wedge F \Rightarrow \neg B$
   * $E \Rightarrow B$
   * $B \Rightarrow F$
   * $B \Rightarrow C$

b. For the above set of sentences, prove the validity of the sentence $\neg A \wedge \neg B$
   * Using Resolution algorithm
   * Using Forward Chaining algorithm

(CO2) (5 + 5)

3. a. Discuss Unification. Specify the most general unifiers for the following sets of terms, if one exists: (CO3) (6)
   L1 = {f(x,y),f(h(a),x)}
   L2 = {f(x,y),f(h(x),x)}
   L3 = {f(x,b),f(h(y),z)}
   L4 = {f(x,x),f(h(y),y)}

b. Discuss Forward chaining algorithm for FOL and discuss with an example.
(CO3) (4)

c. Model the following ontologies into set of relations :   (CO3) (6)
- Herbivores, Carnivores, and Omnivores are animals
- People are omnivores
- People have names of type "string"
- Vegetarians are people who are herbivores
- "eats" is a property of animals and the values of the property must be of the type "food"
- Meat and Veggies are types of food

4. a. A company manufactures an electronic device to be used in a very wide temperature range. The company knows that increased temperature shortens the life time of the device, and a study is therefore performed in which the life time is determined as a function of temperature. The following data is found:

Temperature in C	10	20	30	40	50	60	70	80	90
Lifetime in hours (y)	420	365	285	220	176	117	69	34	5

Determine the linear relationship between the Temperature and the lifetime of the device and use it to determine the lifetime of the device at 68 C. (CO4) (4 +2)

b. What are the advantages of using ANN? Derive and describe with necessary equations the procedure to update the weights in a multi-layer ANN?
(CO4) (1 + 3)

c. Construct a Decision tree classifier model for the following data and predict the risk class of on the following attributes: (0, 1, 0).   (CO4) (4 + 2)

Record	A	B	C	Class
1	0	0	0	Yes
2	0	0	1	No
3	0	1	1	No
4	0	1	1	Yes
5	0	0	1	Yes
6	1	0	1	Yes
7	1	0	1	No
8	1	1	0	No
9	1	1	1	Yes
10	1	1	0	Yes

5. a. Cluster the following points using single and complete link clustering and show the clusters. Draw the dendogram. A1= (4,10,1), A2=(2,5,6), A3=(8,4,3), A4=(5,8,1), A5=(4,5,1), A6=(3,4,1), A7=(1, 6, 1), A8=(4,7,2). Compare the clusters and justify.
(CO5) (5 + 4 +1)

b. For the same dataset use K = 2 and cluster the points using Fuzzy K-means clustering. Assume the degree m = 2.
(CO5) (6)

--- BEST WISHES ---

SHAMEEDHA

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
B.TECH. VI-SEMESTER :: CYCLE TEST II
CSPC51 – COMPUTER ARCHITECTURE

Course/ Branch/Section: B. Tech/CSE/B   Date: 15.10.2024
Max. Marks: 20   Duration: 1 hour

Answer All Questions

1. Consider the following four RISC machine code fragments each containing two instructions:

    i. addi r1 ← r1, #4   ii. add r3 ← r1, r2   iii. breq r1, place   iv. store r3, 17(r10)
       load r2, 7(r1)   store r2, 7(r1)   store r1, 7(r1)   load r2, 12(r8)

    a) i. For each code fragment (i) to (iv) identify each dependence that exists or that may exist   [1]
        (a fragment may have no dependencies).

        ii. For each code fragment, indicate whether data forwarding is sufficient to resolve the   [1]
        dependence or if stall cycles are required. Indicate the number of stall cycles.

    b) The 5 stages of the processor have the following latencies: [3]

	Fetch	Decode	Execute	Memory	Writeback
a.	300ps	400ps	350ps	550ps	100ps
b.	200ps	150ps	100ps	190ps	140ps

    What is the cycle time? What is the latency of an instruction? What is the throughput?:
    For Non-pipelined processor and pipelined processor.

2. The following MIPS program is to be run on a MIPS pipeline processor of form IF-ID-EX-MEM-WB.

    a) Please identify all data dependencies beside each instruction, in the form: <type>on   [3]
        <register> from <line.no> to<line.no> , as WAW on $t6 from L_8 to L_10

            L1 lw $t2, 60($t1)
            L2 lw $t1, 40($t2)
            L3 slt $t1, $t1, $t2
            L4 sw $t1, 20($t2)

    b) Work out and diagram the optimal pipeline schedule using forwarding from EX or MEM   [2]
        stages to any other stage, then compute the pipeline CPI:

3. Find the hazards in the below code and reorder the instructions to avoid any stalls.   [5]

```
lw $t1, 0($t0)
lw $t2, 4($t0)
add $t3, $t1, $t2
sw $t3, 12($t0)
lw $t4, 8($t0)
add $t5, $t1, $t4
sw $t5, 16($t0)
```

4. Consider the following code. Assume an architecture with a unified register file that both floating point and integer ISA registers map to ("x" and "f" registers).

```
loop: (1)   faddi f1, f5, 5
      (2)   sub x6, x5, x4
      (3)   flw f1, 0(x6)
      (4)   fmul f3, f1, f4
      (5)   fmul f9, f9, f8
      (6)   fadd f4, f2, f3
      (7)   fcvt x6, f3 // Convert f3 to an integer and store in x6
      (8)   fsw f4, 0(x6)
      (9)   bne x7, x0, loop // Assume not taken
      (10)  faddi f4, f4, 8
      (11)  faddi f6, f6, 8
```

a) How many RAW hazards are there in the above segment? Write your answer in the form of "(I) -> (J)" to show a dependency between instruction I and J (J reads, I writes).   [1]

b) Show how the processor would perform register renaming in the given code sequence such as to maximize performance by minimizing stalls. Denote renamed registers with P starting with index 1 (i.e., P1). Non-renamed registers can keep their ISA register name. What kinds of hazards does register renaming help with? Explain.   [4]

****************Best Wishes****************

2

National Institute of Technology, Tiruchirappalli
Department of Computer Science and Engineering
RETEST
CSPC51 – Computer Architecture

Branch/Semester/ Section : CSE/ V/ B   Time   : 10:30AM to 11:30 M

Date   : 06.11.2024   Max Marks   : 20

Answer All Questions

1. a. We want to compare the computers R1 and R2, which differ that R1 has the machine instructions for the floating point operations, while R2 has not (FP operations are implemented in the software using several non-FP instructions). Both computers have a clock frequency of 400 MHz. In both we perform the same program, which has the following mixture of commands: **(2.5)**

Type the command	Dynamic Share of instructions in program (p_i)	Instruction duration (Number of clock periods CPI_i)	
		R1	R2
FP addition	16%	6	20
FP multiplication	10%	8	32
FP division	8%	10	66
Non - FP instructions	66%	3	3

13.66

i) Calculate the MIPS for the computers R1 and R2.

ii) Calculate the CPU program execution time on the computers R1 and R2, if there are 12000 instructions in the program?

b. Assuming that N instructions are executed, and all N instructions are add instructions(takes 4clock cycles), what is the speedup of a pipelined implementation when compared to a multi-cycle implementation? Your answer should be an expression that is a function of N. (Assume clock cycle time is 305 ps)   **(2.5)**

2. a. In the following loop, find all the true dependences, output dependences, and antidependences. Eliminate the output dependences and antidependences by renaming.   **(2.5)**

```
for (i=0;i<100;i++) {

        A[i] = A[i] * B[i]; /* S1 */

        B[i] = A[i] + c; /* S2 */

        A[i] = C[i] * c; /* S3 */

        C[i] = D[i] * A[i]; /* S4 */

        }
```

b. Consider the following loop: (2.5)

```
for (i=0;i < 100;i++) {
    A[i] = A[i] + B[i]; /* S1 */
    B[i+1] = C[i] + D[i]; /* S2 */
}
```

Are there dependences between S1 and S2? Is this loop parallel? If not, show how to make it parallel.

3. Explain the two classes of the protocols? A snapshot of the state associated with 2 caches, on 2 separate cores, in a centralized shared memory system is shown below. In this system, cache coherency is maintained with an MSI snooping protocol. You can assume that the caches are direct mapped. (10)

P0	Tag	Data Word 1	Data Word 2	Data Word 3	Data Word 4	Coherency State
Block	1000	10	20	30	40	M
Block 1	4000	500	600	700	800	S
...	...	...	...	...	..	...
Block N	3000	2	4	6	8	S

P1	Tag	Data Word 1	Data Word 2	Data Word 3	Data Word 4	Coherency State
Block	1000	10	10	10	10	I
Block 1	8000	500	600	700	800	S
...	...	...	...	...	..	...
Block N	3000	2	4	6	8	S

i. If P0 wants to write Block 0, what happens to its coherency state?
ii. If P1 writes to Block 1, is Block 1 on P0 invalidated? Why or why not?
iii. If P1 brings in Block M for reading, and no other cache has a copy, what state is it cached in?

National Institute of Technology, Tiruchirappalli
Department of Computer Science and Engineering

END SEMESTER EXAMINATION
CSPC51 – Computer Architecture

Branch/Semester/ Section	: CSE/ V/ B	Time	: 2:00 PM to 5:00 PM
Date	: 25.12.2024	Max Marks	: 50

Answer All Questions

1. a. How do you calculate the cost of an Integrated Circuit (IC)? (2)

   b. Given the following information: Calculate the die yield for both the 1.5 cm² die and the 1.0 cm² die. (2)
   Die size: 1.5 cm on a side; Die size: 1.0 cm on a side; Defect density: 0.047 per cm²; N=12 (Number of defects)

   c. What are the two main measures of dependability for a system? Describe each measure in detail. (2)

   d. Derive the general performance equation for a processor. (4)

2. a. Assume the distribution of instructions that run on the processor is: (2)
   50%: ALU ;   25%: BEQ;   15%: LW;   10%: SW
   Assuming there are no stalls or hazards, what is the utilization of the data memory? What is the utilization of the register block's write port? (Utilization in percentage of clock cycles used)

   b. You are given a non-pipelined processor design which has a cycle time of 10ns and average CPI of 1.4. Calculate the latency speedup in the following questions. (4)
   i. If the 5 stages are 1ns, 1.5ns, 4ns, 3ns, and 0.5ns, what is the best speedup you can get compared to the original processor?
   ii. If each pipeline stage added also adds 20ps due to register setup delay, what is the best speedup you can get compared to the original processor?
   iii. The pipeline from ii stalls 20% of the time for 1 cycle and 5% of the time for 2 cycles (these occurrences are disjoint). What is the new CPI? What is the speedup compared to the original processor?

   c. i. For the code sequence below, state whether it must stall, can avoid stalls using only forwarding, or can execute without stalling or forwarding. (4)
       lw $t0,0($t0);   add $t1,$t0,$t0
   ii. For the code sequence below, state whether it must stall, can avoid stalls using only forwarding, or can execute without stalling or forwarding.
       add $t1,$t0,$t0;   addi $t2,$t0,5;   addi $t4,$t1,5
   iii. For the code sequence below, state whether it must stall, can avoid stalls using only forwarding, or can execute without stalling or forwarding.
   addi $t1,$t0,1;   addi $t2,$t0,2;   addi $t3,$t0,2;   addi $t3,$t0,4;   addi $t5,$t0,5

3.a. The following code implements the DAXPY operation, for a vector length 100. Initially, R1 is set to the base address of array X and R2 is set to the base address of Y. Assume initial value of R3 = 0. The DADDUI instruction before the loop is initialization code and should not be included in the answer to any of the questions. (6)

```
DADDIU R4, R1, #800
FOO: L.D F2, 0(R1)
MUL.D F4, F2, F0
L.D F6, 0(R2)
ADD.D F6, F4, F6
S.D F6, 0(R2)
DADDIU R1, R1, #8
DADDIU R2, R2, #8
DSLTU R3, R1, R4 // set R3 to 1 if R1 < R4
BNEZ R3, FOO
```

Consider the role of the compiler in scheduling the code. Rewrite this loop, but let every row take a cycle (each row can be an instruction or a stall). If an instruction can't be issued in a given cycle (because the current instruction has a dependency that will not be resolved in time), write STALL instead, and move on to the next cycle to see if it can be issued then. Assume that a NOP is scheduled in the branch delay slot (effectively stalling 1 cycle after the branch). Explain all stalls, but don't reorder instructions. How many cycles elapse before the second iteration begins?

b. Now reschedule the loop. You can change immediate values and memory offsets. You can reorder instructions, but don't change anything else. Show any stalls that remain. How many cycles elapse before the second iteration begins? (4)

4. a. For each type of cache miss (Compulsory, Capacity, and Conflict. Miss), suggest one potential method to reduce or mitigate its occurrence in a cache system. (3)

b. Discuss various optimization techniques used to reduce the miss rate in a cache system. For each technique, explain its benefits and any potential drawbacks. (7)

5. a. Consider a system with 4 processors using either a **snooping-based protocol** or a **directory-based protocol**. Assume all caches are initially invalid: **P0** writes to a memory location M; **P1** reads memory location M ; **P2** attempts to write to memory location M. (4)

i. Compare the sequence of events in both protocols.
ii. Which protocol would perform better in terms of reducing bus or network traffic and why?

b. Consider a multiprocessor system with **3 processors (P0, P1, P2)** and a shared memory. The system uses the **MSI (Modified, Shared, Invalid)** protocol for cache coherence. Initially, all caches are empty (invalid state). The following sequence of events occurs: **P0** reads from memory location **M**; **P1** writes to memory location **M**; **P2** reads from memory location **M**; **P0** writes to memory location **M**. (6)

i. Describe the sequence of cache state changes for each processor (P0, P1, P2) using the MSI protocol.
ii. What is the role of the snooping mechanism in this scenario, and how does it ensure cache coherence?
iii. At the end of the sequence, what would be the cache state for each processor? Explain the reasons for each state.

National Institute of Technology, Tiruchirappalli - 15
Department of Computer Science and Engineering

Compensation Test
CSPE56 – Cloud Computing

Course/Department : B.Tech./CSE
Semester/Section : V A & B
Date and Time : 08-11-2024 & 2.00 PM – 3.00PM

Batch : 2022-2026
Session : July/2024
Marks : 20

Answer ALL Questions with proper steps and justification.
Draw diagrams wherever necessary.

1.	Imagine you're running a business where your resources need to magically scale up and down on demand, you only want to pay for what you actually use, and you'd love the freedom to access your services from anywhere. How would cloud computing fit into this, and what are the key features that make it possible?	(3)	CO1
2.	Which cloud delivery models are applicable for the following scenarios? Justify your answer	(2)	CO2
	Scenario 1: A small business specializing in sales and marketing. The business needs a cost-effective way to manage customer relationships, track sales leads, and automate marketing, but it lacks IT infrastructure and technical staff.		
	Scenario 2: A tech startup developing a new mobile application.The startup needs an environment to build, test, and deploy its app quickly without spending resources on underlying infrastructure.		
3.	Discuss how advancements in Internet connectivity and service quality impact the potential of cloud platforms. In your answer, Discuss key technical factors and business considerations.	(3)	CO3
4.	Why is it important to select the right cloud carrier and provider? Discuss how this choice impacts service reliability, performance, and business needs.	(2)	CO3
5.	Explain the concept of virtual servers in the context of cloud computing infrastructure mechanisms, and highlight how they differ from physical servers in terms of resource allocation and management	(3)	CO3
6.	What is Open Nebula ? Explain its architecture and components with diagrams.	(5)	CO4
7.	Beyond simple division of labor algorithms, load balancers can perform a range of specialized runtime workload distribution functions. Explain these advanced functions and their significance in optimizing cloud infrastructure performance	(2)	CO3

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Department of Computer Science and Engineering

Cycle Test-2
CSPE56 – Cloud Computing

Course/Department : B.Tech./CSE   Batch : **2022-2026**
Semester/Section : V A & B   Session : **July/2024**
Date and Time : 15-10-2024 & 3.30 PM – 4.30PM   Marks : **20**

Answer ALL Questions with proper steps and justification.
Draw diagrams wherever necessary.

1.	Explain the cloud Infrastructure mechanism to implement Storage in cloud and write the common logical units provided by them.	(3)	CO3
2.	Why would someone opt for a logical network perimeter to adjust cloud infrastructure without making direct modifications?	(2)	CO3
3.	What are the key advantages of using a Ready-Made platform solution in cloud computing for businesses, and how does it differ from custom-built cloud solutions?	(2)	CO3
4.	What is a resource cluster? Explain the common types of Resource Clusters and their specialized cloud computing mechanisms.	(3)	CO3
5.	Given a situation in which numerous trusted users are granted access to a shared cloud-hosted application, what sophisticated security mechanisms would you deploy to guarantee both the integrity and protection of the data, and through what specific processes would these mechanisms be configured and enforced to mitigate potential threats arising from multi-user access in a cloud environment?	(3)	CO3
6.	Explain the different types of storage options available in AWS, Azure, and GCP, and highlight their primary use cases.	(2)	CO4
7.	List out two pros and cons of AWS, Azure and GCP.	(2)	CO4
8.	What is Eucalyptus? Explain its architecture and working modes with diagrams.	(3)	CO3

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Course/Department : B.Tech./CSE   Batch   : 2022-2026
Semester/Section : V/ A & B   Session : July/2024
Date and Time   : 21-11-2024 & 2.00 PM – 5.00PM   Marks : 50

Answer ALL Questions with proper steps and justification.
Draw diagrams wherever necessary.

1.	(a) Design a suitable Cloud Computing Architecture for the video streaming platform. Draw and label the architecture diagram and explain the roles of the key components you include.		(5)	CO1
	(b) Which cloud deployment models are applicable for the following scenarios? Justify your answer		(2)	CO2
	Scenario 1: A healthcare startup needs to process sensitive patient data, including electronic health records (EHRs). They are required to comply with strict regulations such as HIPAA and want full control over their infrastructure to ensure data security. However, they also need scalability to handle sudden spikes in user demand, especially during health awareness campaigns.			
	Scenario 2: A multinational bank is implementing a risk management system to analyze financial transactions and detect fraudulent activities. The system needs to process highly sensitive customer data, ensure compliance with international regulations, and maintain strict control over who accesses the data. While scalability and advanced analytics are critical, the bank also has strict internal policies that prohibit storing customer data on shared infrastructure. Moreover, they plan to integrate this system with their existing on-premises applications for seamless reporting.			
	(c) What do the term "Any thing as service " (XaaS) encompass ? Describe how XaaS extends traditional cloud service models, and provide two examples of services offered under the XaaS model		(3)	CO2
2.	(a) Discuss the essential web technologies and web applications required for cloud computing. How do these technologies support the development and delivery of cloud services?		(5)	CO3
	(b) What is Service Technology, and how does it contribute to cloud computing? Describe the role of key Services Technologies in building cloud-based environments		(5)	CO3
3.	(a) What is a failover system in cloud computing, and why is it important? Describe the configurations on a failover system to ensure high availability and reliability of cloud services.		(5)	CO3

	(b) What is a Cloud Usage Monitor in cloud computing, and what is its purpose? Explain the different implementation formats used for deploying Cloud Usage Monitors.	(5)	CO3
4.	(a) Explain about Open stack Software Platform and explain in terms of the following aspects: i) Architecture ii) components iii)Benefits and Challenges	(7)	CO4
	(b) What are a Compute Services in cloud platforms like AWS, Azure, and Google Cloud, and how and which containers enhance its functionality?	(3)	CO4
5.	(a) Describe the benefits of deploying a TensorFlow deep learning model on a cloud platform like Google Cloud or AWS, highlighting the role of TensorFlow dimensions and ranks, components, and programming elements in facilitating scalable and efficient model training.	(5)	CO5
	(b) Design and justify a working architecture of any real-time application in Mobile Cloud Computing.	(5)	CO5

BRINDHA

patient
doctor

Class / Semester : III yr CSE / V sem.   Time   : 10:30 to 11.30 AM

Venue & Date   : ORION F10 & 28/08/2024   Max. Marks : 20

<u>Answer all questions</u>

1. What is physical data independence? Give an example. (2)

2. The Prescriptions-R-X chain of pharmacies has offered to give you a free lifetime supply of medicine if you design its database. Here's the information that you gather: (5) Patients are identified by an SSN, and their names, addresses, and ages must be recorded. Doctors are identified by an SSN. For each doctor, the name, specialty, and years of experience must be recorded. Each pharmaceutical company is identified by name and has a phone number. For each drug, the trade name and formula must be recorded. Each drug is sold by a given pharmaceutical company, and the trade name identifies a drug uniquely from among the products of that company. If a pharmaceutical company is deleted, you need not keep track of its products any longer. Each pharmacy has a name, address, and phone number. Every patient has a primary physician. Every doctor has at least one patient. Each pharmacy sells several drugs and has a price for each, A drug could be sold at several pharmacies, and the price could vary from one pharmacy to another. Doctors prescribe drugs for patients. A doctor could prescribe one or more drugs for several patients, and a patient could obtain prescriptions from several doctors. Each prescription has a date and a quantity associated with it. You can assume that, if a doctor prescribes the same drug for the same patient more than once, only the last such prescription needs to be stored. Pharmaceutical companies have long-term contracts with pharmacies. A pharmaceutical company can contract with several pharmacies, and a pharmacy can contract with several pharmaceutical companies. For each contract, you have to store a start date, an end date, and the text of the contract. Pharmacies appoint a supervisor for each contract. There must always be a supervisor for each contract, but the contract supervisor can change over the lifetime of the contract.

a. Draw an ER diagram that captures the preceding information. Identify all constraints captured by the ER diagram.

b. How would your design change if each drug must be sold at a fixed price by all pharmacies?

c. How would your design change if the design requirements change as follows: If a doctor prescribes the same drug for the same patient more than once, several such prescriptions may have to be stored.

3. Suppose that we have a ternary relationship R between entity sets A, B, and C such that A has a key constraint and total participation and B has a key constraint; these are the only constraints. A has attributes a1 and a2, with a1 being the key; B and C are similar. R has no descriptive attributes. Write SQL statements that create tables corresponding to this information so as to capture as many of the constraints as possible. (2)

4. Suppose you have a view SeniorEmp defined as follows: (2)

CREATE VIEW SeniorEmp (sname, sage, salary)
AS SELECT E.ename, E.age, E.salary
FROM Emp E
WHERE E.age > 50

a. Give an example of a view on Emp that could be automatically updated by updating Emp.

b. Give an example of a view on Emp that would be impossible to update (automatically) and explain why your example presents the update problem that it does.

(P. T.O)

5. Consider the following schema:

      Suppliers(sid: integer, sname: string, address: string)
      Parts(pid: integer, pname: string, color: string)
      Catalog(sid: integer, pid: integer, cost: real)
      Write the following queries in relational algebra.

  a. Find the names of suppliers who supply some red part.
  b. Find the sids of suppliers who supply some red or green part.
 c. Find the sids of suppliers who supply some red part or are at 221 Packer Street.

6. Answer the following questions about the table below:

model	make	type	color	country	year	expensive
Accord	Honda	sedan	black	Japan	1999	no
Accord	Honda	coupe	blue	Japan	2000	no
Accord	Honda	sedan	green	Japan	2001	no
s2000	Honda	sports	grey	Japan	2000	yes
Civic	Honda	coupe	white	Japan	2003	no
Civic	Honda	compact	red	Japan	2000	no
m3	BMW	sports	blue	Germany	2002	yes
m3	BMW	sports	black	Germany	2003	yes
330ci	BMW	compact	black	Germany	2003	no
E500	Mercedes	luxury	grey	Germany	2003	yes
ML500	Mercedes	SUV	black	Germany	2004	yes

  a. List the functional dependencies that might hold.
  b. List the candidate keys.
  c. List update, insertion, and deletion anomalies associated with this schema.

7. Relation R = SNCPXYQ was decomposed into {SNC}, {PXY}, and {SPQ}. Considering the following functional dependencies S->NC, P->XY, and SP->Q, Find whether this decomposition had a lossless join. (2)

8. Consider the following ER diagram. While converting to relational model, how many tables are possible at maximum? (1)
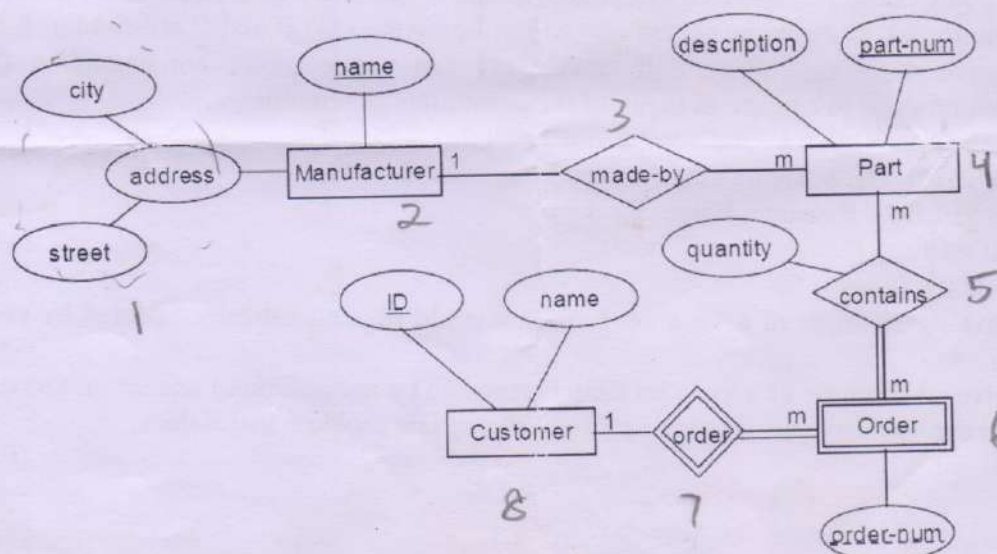
National Institute of Technology, Tiruchirappalli - 15.

Department of Computer Science & Engineering

CSPC52- Database Management Systems

<u>Cycle Test –II</u>

Class / Semester : III yr CSE / V sem.   Time   : 03.30 to 04.30 PM
Venue & Date   : ORION-F10 & 16/11/2024   Max. Marks : 20

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1. Consider the following two transactions: (4)

    T1: read(A);
    read(B);
    if A = 0 then B := B + 1;
    write(B).
    T2: read(B);
    read(A);
    if B = 0 then A := A + 1;
    write(A).

Let the consistency requirement be $A = 0 \lor B = 0$, with $A = B = 0$ the initial values.

a. Show that every serial execution involving these two transactions preserves the consistency of the database.

b. Show a concurrent execution of T1 and T2 that produces a nonserializable schedule.

c. Is there a concurrent execution of T1 and T2 that produces a serializable schedule?

2. Identify the type of representation of records for the following figure: (4)

0	Perryridge	A-102	400	
1	Round Hill	A-305	350	
2	Mianus	A-215	700	
3	Downtown	A-101	500	
4	Redwood	A-222	700	
5		A-201	900	
6	Brighton	A-217	750	
7		A-110	600	
8		A-218	700	

Show the structure of the file of the above figure after each of the following steps:

a. Insert (Mianus, A-101, 2800).

b. Insert (Brighton, A-323, 1600).

c. Delete (Perryridge, A-102, 400).

3. Consider a relation R (A, B, C, D, E) with FDs {AB -> C, DE ->C, and B -> D}   (4)

a. Indicate all BCNF violations for R.

b. Decompose the relations into collections of relations that are in BCNF.

c. Indicate which dependencies if any are not preserved by the BCNF decomposition.

(P.T.O)

4. (a) Consider the following log sequence of two transactions on a bank account, with initial balance 12000, that transfer 2000 to a mortgage payment and then apply a 5% interest. (2)

1. T1 start
2. T1 B old=12000 new=10000
3. T1 M old=0 new=2000
4. T1 commit
5. T2 start
6. T2 B old=10000 new=10500
7. T2 commit

Suppose the database system crashes just before log record 7 is written. When the system is restarted, which operations to be done by the recovery procedure?

(b) Consider the following log records: (2)

1	<START T1>
2	<T1, A, a>
3	<T1, B, b>
4	<START T2>
5	<T2 C, c>
6	<START T3>
7	<T3 D, d>
8	<T2,E,e>
9	<START T4>
10	<T4,F,f>
11	<T3,G,g>
12	<COMMIT T2>

(i) When can we write each datum in the disk?
(ii) What do we do after the DBMS crashes and restarts? Write the recovery procedure.

5. With suitable locks/unlocks, make the following schedule to be allowed in 2PL and not by strict 2PL? Justify. (4)

$$
\begin{bmatrix}
T1 & T2 \\
R(A) & \\
W(A) & \\
 & R(A) \\
 & W(A) \\
 & R(B) \\
 & W(B) \\
 & Commit \\
Abort &
\end{bmatrix}
$$

National Institute of Technology, Tiruchirappalli - 15.
Department of Computer Science & Engineering
CSPC52- Database Management Systems
Retest-2024

Class / Semester : III yr CSE / V sem.   Time   : 9:30 to 10.30 A.M
Date   : 29/10/2024   Max. Marks : 20

Answer all Questions

1. Consider the below table: (4)

| OID	O Date	CID	C Name	C State	PID	P Desc	P Price	Qty
1006	10 24 09	2	Apex	NC	7, 5, 4	Table, Desk, Chair	800, 325, 200	1, 1, 5
1007	10 25 09	6	Acme	GA	11, 4	Dresser, Chair	500, 200	4, 6

   a. Derive the functional dependencies of the above table.
   b. What is the maximum normal form of this relation. Normalize it till 3NF.

2. (a) A university registrar's office maintains data about the following entities: (a) courses, including number, title, credits, syllabus, and prerequisites; (b) course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom; (c) students, including student-id, name, and program; and (d) instructors, including identification number, name, department, and title. Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled. Construct an E-R diagram for the registrar's office. Document all assumptions that you make about the mapping constraints.
(2)

(b) Find the minimum number of tables required to represent the given ER diagram in relational model. Also, derive the relation schemas for the tables.
(2)
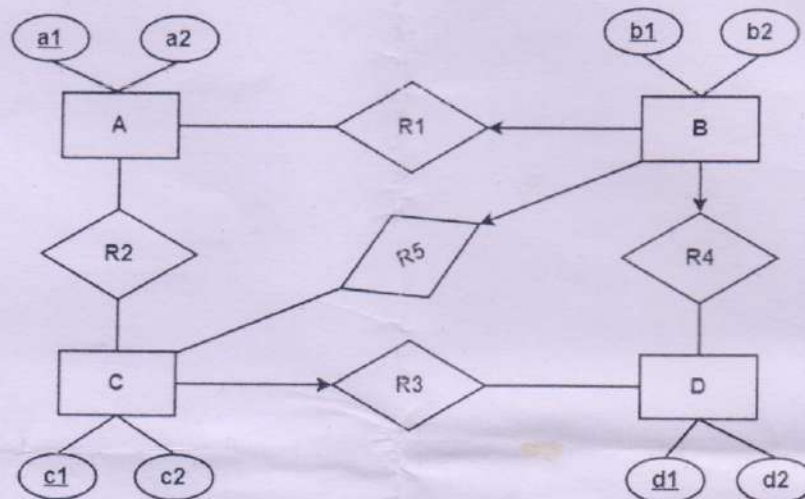
3. Discuss any two concurrency control schemes with neat examples and analyze it with respect to various parameters like conflict serializability, deadlock, inconsistency, Recoverable schedule, Cascadeless Schedules and Starvation.   (4)

4.List and explain the deadlock prevention schemes with neat examples. Explain the advantages and disadvantages of each scheme. (4)

5. Consider a B+-tree with a maximum number of pointers per node is 5 and the maximum number of entries is 4. (4)
a. Show the results of entering one by one the keys that are three letter strings: (era, ban, bat, kin, day, log, rye, max, won, ace, ado, bug, cop, gas, let, fax) (in that order) to an initially empty B+-tree. Assume that you use lexicographic ordering to compare the strings. Show the state of the tree after every 4 insertions.
b. What is the utilization of the tree? The utilization of the tree is defined as the total number of entries in all the nodes of the tree (both leaf and non-leaf nodes) over the maximum number of entries that the same nodes can store.