National Institute of Technology, Delhi

Name of the Examination: B.Tech.

End Semester Examination - MAY 2023

Branch : CSE   Semester : VI

Title of the Course : Microprocessors and Interfacing   Course Code : ECB355

Time: 3 Hours   Maximum Marks: 50

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Ability to analyze and develop the basic architecture of microprocessors 8085 and 8086 and microcontroller.	Understanding (Level II)
CO2	Ability to interface peripherals with Microprocessors and Microcontrollers	Analyzing (Level IV)
CO3	Ability to analyze and develop the assembly language program for microprocessor 8085 and microcontroller 8051	Evaluating (Level V)
CO4	Ability to design and create microprocessor/microcontroller-based system	Analyzing (Level IV)

Course Outcomes(CO's)	CO1	CO2	CO3	CO4
Questions No.	3,4,7,8,11,14	12,5,6	1,2,9,10	13,15,16,17

Part A: 10x02 = 20 Marks

Answer all the questions

Q1. Write a program using 8085 instruction sets to read the content in the flag register and store it in the memory address 8000.

Q2.
XRA A
MVI A, 87H
ADI 79H
MOV M, A
Specify the content of the accumulator and the flag register.

Q3. What do you mean by pipelining in an 8086 processor?

Q4 What is a coprocessor? How is it useful?

Q5. If 64 external interrupts are connected to the 8085/8086 processor, how many 8259 need and how are connected (Block diagram approach)?

Q6. List the difference between memory-mapped I/O & peripheral mapped I/O.

Q7. How do you differentiate the external data memory and program memory in the 8051 microcontroller?

Q8 Difference between RISC and CISC architecture.

Q9. Write 8051 instruction to (a) load 00H in the accumulator (b) decrement the accumulator (c) Display the answer. Specify the answer you would expect at the output port.

Q10. Discuss the interfacing of push-button switches and LEDs with the 8051 microcontroller.

Part B: 04x05 = 20 Marks

Answer any four questions

Q11. Discuss the various addressing modes of the 8085 microprocessor.

Q12. Explain how data can be transferred using 8251 USART at different baud rates.

Q13. With a neat diagram explain the method of interfacing the stepper motor with a microprocessor.

Q14 Discuss the Special Function Registers in the 8051 microcontroller.

Q15. (i)Briefly explain the Timer/counter-programming in the 8051 microcontroller.
(ii)To get a 100μs delay, what Hexa value should be loaded into the TH register using mode 2 operations? Assume XTAL = 11.0592 MHz.

Part C: 10x01 = 10 Marks

Q16. Explain the traffic control system in a four-road junction using the 8085/8086 microprocessor. (Complete hardware and ALP).

(Or)

Q17. Design an 8051 microcontroller-based Washing machine control system and explain it with a neat diagram (Complete hardware and ALP).

Branch: Computer Science Engineering Semester: VI
Title of the Course: Cloud Computing Course Code: CSL 376
Time: 02:00 - 05:00 Maximum Marks: 50

Question paper Mapping with CO

Q. No.	1	2	3	4	5	6
Marks	(5+5 = 10)	5	5	(4+6 = 10)	(5+5+5 = 15)	5
CO	CO 1	CO 2	CO 4	CO 3	CO 3	CO 4

Q 1 I. Explain the key steps involved in migrating to the cloud. Discuss advantages of 5 M CO 1
cloud computing in IT field.

II. Justify the statement-"Cloud computing reduces the cost". Also. State the effect 5 M
of cloud computing on Green House Gas.

Q2 Mobile devices could benefit from cloud computing; explain the reasons you think that 5 M CO 2
this statement is true or provide arguments supporting the contrary. Discuss several
cloud applications for mobile devices; explain which one of the three cloud computing
delivery models, SaaS, PaaS, or IaaS, would be used by each one of the applications
and why.

Q3 Several desirable properties of a large-scale distributed system includes transparency 5 M CO 4
of access, location, concurrency, replication, failure, migration, performance, and
scaling. Analyze how each one of these properties applies to AWS.

Q4 I. Virtualization simplifies the use of resources, isolates users from one another, 4 M CO 3
supports replication and mobility, but exacts a price in terms of performance and
cost. Analyze each one of these aspects for: (i) memory virtualization, (ii)
processor virtualization, and (iii) virtualization of a communication channel.

II. Virtualization of the processor combined with virtual memory management pose 6 M
multiple challenges; analyze the interaction of interrupt handling and paging.

Q5 I. Explain the process of spilling in MapReduce? What is a distributed cache in 5 M CO 3
MapReduce Framework?

II. Explain the architecture of HDFS (Hadoop Distributed File System (HDFS). 5 M
Also, describe the fault-tolerant phenomena in HDFS.

III. Discuss Hypervisor and it's types. Also, explain Eucalyptus and it's components. 5 M

Q6 The Dell company in USA virtualized more than 5,000 servers and spared the 5 M CO 4
organization over US $29 million utilizing a versatile, worldwide virtualization model.
Explain the challenges, solutions and benefits of the virtualization model adopted by
DELL.

Course Matrix (CO-PO-PSO Mapping)

COs	POs													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	3	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-	2	2
CO3	3	3	3	2	-	-	-	-	-	-	-	-	2	2
CO4	3	3	3	2	-	-	-	-	-	-	-	-	3	3

1=Addressed to small extent
2= Addressed significantly
3= Addressed strongly (major part of course)

National Institute of Technology Delhi

Name of the Examination: End Sem Examination (May, 2023)

Branch: CSE (B.Tech., VI sem.)
Title of the Course: Data Mining

Time: 3 Hours

Note: 1. Attempt all questions. 2. Read all questions carefully 3. Missing parameters or values may be assumed.

Semester: VI

Course Code: CSB 352

Maximum Marks: 50

Q.No.	1	2	3	4	5
C.O.	CO1	CO5	CO3	CO4	CO2

1. (a) Justify the statement, "Goal of dimensionality reduction is to discover the axis of data!" with example. Give the complete Definition of SVD with explaining all the variables and their interpretations. (5)

   (b) A matrix M is given, $\begin{bmatrix} 3 & 1 & 1 \\ -1 & 3 & 1 \end{bmatrix}$ (5)

   What is the rank of this matrix?

   i. Compute the matrices $M^T M$ and $M M^T$.

   ii. Find the eigenvalues for your matrices of part (i)

   iii. Find the eigenvectors for the matrices of part(i)

   iv. Find the SVD for the original matrix M from parts (ii) and (iii).

2. (a) In the recommendation systems, the ratings of the items most similar to i that were rated by user x is predicted by, (5)

$$\hat{r} = \frac{\sum_{j \in N(i;x)} s_{ij} \cdot r_{xj}}{\sum_{j \in N(i;x)} s_{ij}}$$

   where, s_{ij} is the similarity of items i and j, r_{xj} is the rating of user x on item j, $N(i; x)$ is the set of items similar to item i that were rated by x.
   Now, explain the recommendation method for better recommendation by using weights, w_{ij} instead of s_{ij}. How these weights are calculated by optimization in *Netflix Challenge* problem.

   (b) Justify the statement, "In practice, it has been observed that item-item often works better than user-user" with a suitable example. (4)

3. (a) Prove that sequence $M.r^0, M^2.r^0, \cdots M^k.r^0, \cdots$ in PageRank approaches the dominant eigenvector of M. Where, M is the stochastic adjacency matrix and r is the PageRank vector. (5)
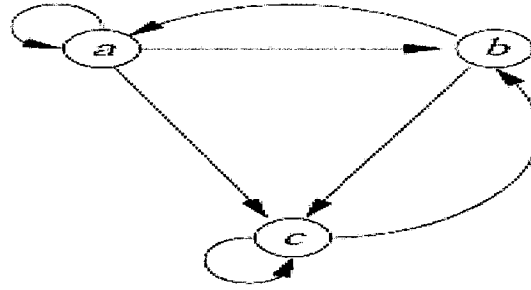
Figure 1: WWW Graph

(b) What are the problems in the PageRank calculation? What are the solutions (5) to overcome these problems explain with example. How actually compute the PageRank after considering such solutions ?

4. (a) Compute the PageRank of each page in Fig. 1, assuming $\beta = 0.8$. (4)

(b) Using item-item Collaborative filtering estimate the rating of movie 3 by user 3 (5) by considering 2-nearest neighbour (Consider Utility Matrix mentioned in Figure 2, representing the ratings, on a 1–5 star scale)

		users											
		1	2	3	4	5	6	7	8	9	10	11	12
movies	1	1		3			5			5		4	
	2			5	4			4			2	1	3
	3	2	4			1	2		3		4	3	5
	4		2	4		5			4			2	
	5			4	3	4	2					2	5
	6	1		3		3			2			4	

[ ] - unknown rating   [ ] - rating between 1 to 5

Figure 2: Utility Matrix

5. (a) Define adwords problem. (2)

(b) Write BALANCE algorithm for adwords problem? Prove that its performance (5) is better than the online Greedy algorithm for adwords problem. Justify it by considering an example. Explain all the used variables clearly.

(c) How to calculate modularity Q, a measure of how well a network is partitioned (5) into communities. What is the concept of Spectral Clustering algorithms?

National Institute of Technology, Delhi

Name of the Examination: B.Tech/M.Tech/Ph.D
END Semester Examination (Spring, 2023)

Branch   : B.Tech   Semester   : 6th

Title of the Course : Compiler Design   Course Code   : CSB353

Time   : 3 Hours   Maximum Marks : 50

Note: Read all questions carefully.

Course Outcomes (CO's)	CO1	CO2	CO3	CO4
Questions No.	1	2, 3	4, 5, 6, 7	8

Answer the following questions.

1. (a) During which phase of the compiler, 'Type checking' is performed?
(b) Match the following in List 1 with the corresponding option in List 2:

List 1	List 2
(i) Lexical Analysis	1. Graph Coloring
(ii) Parsing	2. DFA minimization
(iii) Register Allocation	3. Post-order traversal
(iv) Expression Evaluation	4. Production Tree

(c) Which data structure in a compiler is used for managing information about variables and their attributes?
(d) The process of assigning load addresses to the various parts of the program and adjusting the code and data in the program to reflect the assigned addresses is called _____
(e) Consider line number 3 of the following C program

```
        int main ()                      /*Line 1 */
        {
              int I, N;                   /*Line 2 */
              fro (I=0, I<N, I++);        /*Line 3 */
        }
```

Identify the compiler's response about this line while creating the object module.   **(05 Marks)**

2. Write short notes on the following:
(a) Phases of Compiler (along with diagram)
(b) Recursive Descent Parser
(c) Code Generation
(d) Context-Free Grammar and Syntax Analyzer   **(08 Marks)**

3. Consider the intermediate code below and find the number of nodes and edges required to construct the control flow graph for the same.   **(05 Marks)**

```
1.  i = 1
2.  j = 1
3.  t1 = 5 * i
4.  t2 = t1 + j
5.  t3 = 4 * t2
6.  t4 = t3
7.  a[t4] = -1
8.  j = j + 1
9.  if j <= 5 goto(3)
10. i = i + 1
11. if i < 5 goto(2)
```

4. Considering the intermediate code generation phase, translate the following program snippet into three address code. Assume matrices are stored in row-major order.

```
for (i=0;i<n;i++)
        for (j=0;j<n;j++)
                c[i][j] = 0.0;
for (i=0;i<n;i++)
        for (j=0;j<n;j++)
                for (k=0;k<n;k++)
                        c[i][j] = c[i][j] + a[i][k] * b[k][j];
```
                                                                              (05 Marks)

5. (a) Explain Code Optimization.   **(02 Marks)**
(b) Consider the following basic block, in which all variables are integers and ** denotes exponentiation. Assume that the only variables that are live at the exit of this block are v and z. In order, apply the following optimizations to this block. Show the result of each transformation.

```
a:= b+c
z:= a**2
x:= 0*b
y:= b+c
w:= y*y
u:= x+3
v:= u+w
```

(a) Strength Reduction
(b) Common sub-expression elimination
(c) Copy propagation
(d) Constant Folding
(e) Dead Code Elimination   **(07 Marks)**

6. Attempt any one
6.1 (a) Write CFG that accepts the binary strings or their complements (represented by a negation sign ¬). The value of a (non-negated) string is just the decimal value of the binary number the string represents; the value of a negated string is the decimal value of the complement of the binary string. For ex, the value of 010 is 2 and ¬ 010 is 5.
(b) Write the semantic rules to calculate the decimal value of an input string. Your solution must use at least one inherited attribute. Justify your answer with annotated parse tree for the string ¬ 1010.   **(10 Marks)**
<div align="center">OR</div>
6.2. The below-mentioned grammar generates binary numbers with a "decimal" point:

$$S \rightarrow L.L \mid L$$
$$L \rightarrow LB \mid B$$
$$B \rightarrow 0 \mid 1$$

(a) Design an L-attributed SDD to compute S.val, the decimal-number value of an input string.
For example, the translation of string 101.101 should be the decimal number 5.625.
(b) Justify your answer with annotated parse tree for string 101.101.   **(10 Marks)**

7. (a) You just witnessed a bank robbery and got a partial license plate of the getaway vehicle. It started with 'HR', had an 'R' somewhere in the middle and ended with 3. Help the police officer write regular expression for this plate and implement a lexer for the same.
(b) A robot moves on a square grid. The robot can go forward (f), turn left (l), or turn right (r). Give a grammar to describe the language of all 8 sequences of moves that leave the robot pointing in the same direction as when it started.
                                                                              (8 Marks)

Branch: Computer Science Engineering   **Semester: VIth**
Title of the Course: Network Programming   **Course Code: CSB 351**
Time: 3 Hrs   **Maximum Marks: 50**

Question Paper mapping with CO

Q.No.	1	2	3	4	5	6	7
Marks	8	6	6	10	6	6	8
CO	1	2	2	3	4	3	4

Q: 1 a) Write briefly about getsockopt and setsockopt functions   3

 b) Compare the IPC functionality provided by pipes, message, shared   2
    memory.

 c) Draw a diagram that shows the calling sequence of socket system   CO1
    calls for connectionless communication between a Client and Server. 3

Q: 2 a) Explain with syntax and examples the following functions:

 • readv and writev functions

 • recvmsg and sendmsg functions   4

 b) Discuss the function of MSG_PEEK flag in the recvmsg and
    sendmsg functions?   2   CO2

Q: 3 a) Briefly describe POSIX Signal Handling and Termination of Server
    Process   3

 b) Explain the following signals:

 • SIGIO   CO2

 • SIGURG

 • SIGPIPE   3

Q: 4   a) Explain dg_cli Function Using Broadcasting and dg_cli Function
            Using Multicasting.   6
                                                                              CO3
        b) Briefly illustrate about UDP echo server functions and lost data   4
            gram

Q: 5   a) Consider an application with TCP Echo Server and TCP Echo Client
            application. Implement the procedural steps what happens to the
            client when the server process crashes?   4

        b) Apply the getaddr info function to IP_{V6} in multicasting and illustrate
            the steps.   2   CO4

Q: 6   Explain with short notes about:
        a) Transparency issues handling in Sun RPC   3

        b) Multithreading in RPC's   3   CO3

Q: 7   a) Explain and discuss the Internet Control Message Protocol (ICMP)
            and whether it is connected or connectionless environment. Discuss
            two commonly employed ICMP message applications.   4

        b) Briefly implementation the steps for communication in the remote
            procedure calls and the RPC Doors within the application.   4   CO4

Course Matrix (CO-PO-PSO Mapping)

COs	POs													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	--	--	--	--	--	--	--	--	3	2
CO2	3	3	3	2	--	--	--	--	--	--	--	--	3	3
CO3	3	2	3	2	--	--	--	--	--	--	--	--	2	2
CO4	3	2	2	2	--	--	--	--	--	--	--	--	2	3

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National Institute of Technology, Delhi
Name of the Examination:
End-Semester Examination (2023)

Program/Branch: BTech/Minor Degree in AIML   Semester: VI
Title of the Course: Machine Learning   Course Code: CSB 311
Time: 3 Hours   Maximum Marks: 50

Question Paper mapping with CO

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12
Marks	2	2	2	2	2	5	5	6	6	6	6	6
CO	CO1	CO2	CO1	CO3	CO4	CO2	CO1	CO2	CO3	CO3	CO4	CO4

Note: 1) Make suitable assumptions wherever required
      2) The symbols have their usual notations

Q1) Describe different types of cross validation techniques.

Q2) Write any four common Machine Learning problems that Unsupervised Learning can help with. Explain them briefly.

Q3) State, how is logistic regression different from linear regression?

Q4) Interpret optimal Q learning by suitable mathematical expression.

Q5) Does feature extraction always reduces the dimension of the input data? Explain your answer by a suitable example.

Q6) Consider a medical diagnosis problem in which there are two alternative hypotheses: (1) that the patient has a particular form of cancer and (2) that the patient does not. The available data is from a particular laboratory test with two possible outcomes: positive and negative. We have prior knowledge that over the entire population of people only 0.008 have this disease. Furthermore, the lab test is only an imperfect indicator of the disease. The test returns a correct positive result in only 98% of the cases in which the disease is actually present and a correct negative result in only 97% of the cases in which the disease is not present. In other cases, the test returns the opposite result. Suppose we now observe a new patient for whom the lab test returns a positive result. Should we diagnose the patient as having cancer or not? Explain by calculating the suitable prior, posterior, likelihood and evidence probabilities.

Q7) What is the practical advice on how to use machine learning algorithms? Explain by taking any real life example in context with machine learning pipeline.   PTO

Q8) Identify the clusters of the data in Table 1 using nearest neighbor clustering algorithm single link technique. Use Euclidean distance and draw the Dendogram of the clusters formed. P_i represents the points of the samples with their X and Y coordinates.

Table 1

Sample No.	X	Y
P1	0.4	0.53
P2	0.22	0.38
P3	0.35	0.32
P4	0.26	0.19
P5	0.08	0.41
P6	0.45	0.30

Q9) Interpret the following terms in context with Reinforcement Learning. Use the desired mathematical variables and expressions to explain.

    a) Markov Decision process   b) Finite Horizon episodic model   c) Infinite Horizon episodic model   d) Optimal policy   e) Bellman's Equation

Q10) Define model based learning. Explain 'value iteration' and 'policy iteration' algorithms for model based learning with suitable mathematical equations and example(s).

Q11) Find the first principle components of the sample features $X1$ and $X2$ given in Table 2.

Table 2

Feature	Sample 1	Sample 2	Sample 3	Sample 4
$X1$	4	8	13	7
$X2$	11	4	5	14

Q12) Calculate the Singular value decomposition of the matrix A, $U\Sigma V^T$, where $A = \begin{pmatrix} 3 & 2 & 2 \\ 2 & 3 & -2 \end{pmatrix}$.

Course Matrix (CO-PO-PSO Mapping)

COs	POs													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	1	1	1	1	-	-	-	1	-	-	1
CO2	3	2	-	1	2	3	3	-	-	-	2	-	2	2
CO3	3	2	-	2	2	3	3	-	-	-	2	-	2	2
CO4	2	2	-	1	1	3	2	-	-	-	1	-	1	1

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