Subject Code - BMS-09 **Roll No.** 2 0 2 6 0 2 1 0 5 5

B. Tech.
(SEM: IV) EVEN SEMESTER
MAJOR EXAMINATION 2021 – 2022

Optimization Technique

Time: 3 Hrs. **Max. Marks: 50**

Note: Attempt all questions. Each questions carry equal marks.

1. Attempt any five parts of the following: **(5× 2 = 10)**

(a) Solve the following Linear Programming problem by Simplex method:
$Maximize\ z = 5x + 3y$ subject to $x + y \leq 2,\ 5x + 2y \leq 10,\ 3x + 8y \leq 12,\ x \geq 0,\ y \geq 0.$

(b) Consider the problem: $Minimize\ z = x + y$ subject to $x + 2y \geq 7,\ 4x + y \geq 6,\ x \geq 0,\ y \geq 0$. Solve by dual simplex method.

(c) Give the dual of LP problem with proper justifications: $Min\ z = 2x_1 - 4x_2 + 5x_3$ subject to the constraints: $x_1 + 2x_2 - 5x_3 \geq 12,\quad 4x_1 - 3x_2 - 8x_3 = 5,\quad 3x_1 + 2x_2 - 5x_3 \leq 9$
$x_1, x_2 \geq 0$ and x_3 is unrestricted.

(d) Find all extreme points of the function $f(x_1, x_2, x_3) = 3x_1^3 - x_2^3 + x_3^3 - 4x_1 + 12x_2 - 24x_3$. Let the point $(\frac{2}{3}, -2, 2\sqrt{2})$ is the extreme point of the function, show the nature of this extreme point $(\frac{2}{3}, -2, 2\sqrt{2})$.

(e) Find the minimum of the function $f(x) = x^5 - 5x^3 - 20x + 5$ in the range $(-1, 5)$ by Fibonacci method with taking n = 5. Also discuss the validity of results.

(f) Discuss the nature of two non – zero extreme points of the problem:

$$f = x_1^3 - 3x_1x_2^2 + 6x_2^3 + x_2^2 + \left(\frac{1}{3}\right)x_3^3 - x_2x_3^2.$$

(g) Maximize $f(x_1, x_2) = -2x_1^2 - 3x_2^2 + 2x_1x_2 + 3x_1 + 4x_2$ subject to the conditions $x_1 - 4 \leq 0$. By method of Kuhn – Tucker conditions. Discuss all cases.

2. Attempt any two parts of the following: **(2× 5 = 10)**

(a) Minimize $f(x_1, x_2, x_3) = 2x_1^2 + 2x_2^2 + x_3^2 - 2x_1x_2 + 3x_2x_3 - x_1 - 2x_2$ with starting point $\begin{Bmatrix}1\\0\\1\end{Bmatrix}$ by Univariate method up to three iterations given that $\varepsilon = 0.01$.

(b) Minimize $f(x_1, x_2) = 6x_1^2 + 2x_2^2 - 6x_1x_2 - x_1 - x_2$ with starting point $\begin{Bmatrix}1\\2\end{Bmatrix}$ by Steepest Descent method up to two iterations.

(c) Minimize $f(x_1, x_2) = 5x_1^2 - 3x_1x_2 + \left(\frac{3}{5}\right)x_2^2 - \left(\frac{5}{3}\right)x_1 - x_2$ in the range $-2 \leq x_1 \leq 4$ and $-3 \leq x_2 \leq 6$ by using random search method up to 10 iterations given the set of values as $\{(r_1, r_2) = (0.50, 0.60), (.25, .26), (.98, .97), (.45, .46), (.234, .235), (.63, .64), (.543, .544), (.712, 0.713), (.434, .435), (.782, .783)\}$.

3. Attempt any two parts of the following: **(2× 5 = 10)**

(a) Minimize $f(x_1, x_2) = x_1^4 - 2x_1^2x_2 + x_1^2 + x_2^2 - 10x_1 + 20x_2 + 10$ with starting point $\begin{Bmatrix} 1.0 \\ -1.0 \end{Bmatrix}$ by Newton's method up to two iterations.

(b) Explain the procedure to find the solution of Non-linear programming problem of the following methods (i) Steepest Descent method (ii) Newton's method.

(c) Minimize $f(x_1, x_2) = (x_1 + 2x_2 - 7)^2 + (2x_1 + x_2 - 5)^2$ with starting point $\begin{Bmatrix} -1.0 \\ 1.0 \end{Bmatrix}$ by Newton's method up to two iterations.

4. Attempt any two parts of the following: **(2 × 5 = 10)**

(a) What is posynomial? Explain properly the procedure to solve the unconstrained Geometric minimization problem. Write the geometric dual of the given problem: Minimize $f(X) =$

$x_1x_2^{-1}x_3^{-2} + 2x_1^{-2}x_2^{-1}x_3 + 2x_1x_3x_2 + 3x_1x_2^{-1/2} + x_1^{1/2}x_3x_2, \quad x_i \geq 0, \quad i = 1,2,3.$

(b) Optimize the geometric problem:

Minimize $f(X) = 7x_1x_2^{-1} + 3x_2x_3^{-2} + 5x_1^{-3}x_2x_3 + x_1x_2x_3, \quad x_i \geq 0, \quad i = 1,2,3.$

(c) Derive the geometric dual of given problem: Min $f(X) = x_1^{-\frac{3}{4}}x_2 + x_1^{\frac{3}{2}}x_2^{-2}x_3^{-\frac{1}{3}} + x_1x_2^{-3}x_3^{-1}$ subject to $\frac{7}{5}x_1^3x_2^{-1} + 6x_1^{-1}x_3^{-1/2} \leq 1.$

5. Attempt any two parts of the following: **(2 × 5 = 10)**

(a) Minimize $f(X) = x_1^{-2}x_2^{-1} + \frac{1}{4}x_1^2x_2^{-1}x_3^{-1} + x_1^{-1}x_3^2x_4$ subject to $\frac{3}{4}x_1x_2 + \frac{3}{8}x_2x_3x_4^{-3} \leq 1 \quad x_i \geq 0, \quad i = 1,2,3$ by geometric programming method.

(b) Minimize $f(X) = 10x_2x_3x_4^4 + 40x_1^2x_3^{-1} + 5x_2x_3^2$ subject to

$$5x_2^{-5}x_3^{-1} \leq 1,$$
$$10x_1^{-1}x_2^3x_4^{-1} \leq 1, \quad x_i > 0, \quad i = 1 \text{ to } 4$$

by geometric programming method.

(c) Minimize x_1 subject to

$$-3x_1^2 + 4x_2 \leq 1,$$
$$x_1 + x_2 \geq 1,$$

and $x_1 > 0, x_2 > 0$ by procedure of complementary geometric programming method.

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MBA 113 Roll Number 2020021010

Management Information System
B.Tech. (IV Sem.) MBA (II Sem.) Even Semester
Major Examination 2021-2022

Max Marks :50Time: 3 Hrs

Note : Attempt all Questions. Each Questions carry equal marks.

1. Attempt any five parts of the following: (5 X 2=10)

(a) What are the objectives ofManagement Information System?

(b) Write short notes on: a)Information b) System

(c) Define Management and its function.

(d) Describe the key features of MIS.

(e) What do you mean by user training? Elaborate.

(f) Elaborate the term strategic planning.

(g) Define potential benefits of collecting the data.

2. Attempt any two parts of the following:~~(5 X 2=10)~~ (2×5=10)

(a) Define information flow chart. Explain its implication and importance.
(b) What are three different levels of management? Highlight the role of each management levels in terms of MIS.
(c) What is documentation and formats in Management Information System? Explain in detail.

3. Attempt any two parts of the following:(5 X 2=10)

(a) Define designing of MIS. Elaborate water fall model in the context of MIS designing.
(b) What are the stages of planning of MIS? How it is helpful for the Organization?
(c) Discuss some basic need and dimensions for management information system.

4. Attempt any two parts of the following:(5 X 2=10)

(a) What are the constraints in MIS operation? Discuss its limitations.

(b) What do you know about source of information in MIS? Discuss some relevant source of information

(c) How will you define the approaches of development of MIS ?Also define at least two types of development approaches.

5. Attempt any two parts of the following: (5 X 2=10)

(a) Throw light on implantation of MIS. Explain its all methods in the organization.

(b) Discuss the behavioral implications of MIS.

(c) What are the approaches of evaluation of MIS? Make understand product-based evaluation.

Subject Code -BCS-15 Roll No. 2 0 2 0 0 2 1 0 [illegible]

B.Tech.
EVEN SEMESTER
Major Examination 2021-2022
Database Management System

Time: 3 Hrs. **Max. Marks: 50**

Note: Answer all questions. Each question carries equal marks.

Q.1 Consider the following schema **(5×2=10)**

Customer (cu_ID, cu_name, cu_type, cu_credit_limit)

Purchase (cu_ID, it_ID, pu_dateofsale, pu_quantity)

Item (it_ID, it_name, it_costperUnit)

Perform any five of the following operations on these tables using SQL

(a) Create the three tables giving suitable domains and constraints including referential actions.

(b) Add one additional filed it_type in the item table, create a secondary index on it_name and drop any one constraint that you have created in step (a)

(c) Create a view named SingleCustomer that shows the customer all the purchases made by him/her only.

(d) Find the list of the customer names and type of those customers who have purchased an item named "Cricket Bat"

(e) List the customer names and credit limit of those customers who have bought more than five items

(f) Create the list of items purchased by a customer whose ID is "C001" in the decreasing order of cost per unit of those items.

(g) Calculate the total amount that is to be paid by customer "C001" on all the items purchased on 30th May 2022 by him/her.

Q.2 Attempt any two parts of the following. **(2×5=10)**

(a) Define the term functional dependency and all of its variants. Explain each of them with a suitable example.

(b) Define closure set of a set of attributes of a relation and state its relevance. Prove that If $R = ABCDEG$ and set of functional dependencies holding on R is $\{AB \rightarrow C, C \rightarrow A, BC \rightarrow D, D \rightarrow EG, BE \rightarrow C, CG \rightarrow BD, CE \rightarrow AG\}$, then $BD \rightarrow AC$ follows from Armstrong's Axioms. .

(c) Define Lossless Join Decomposition of a relation and write algorithm for its testing. Trace the algorithm if the given relation is $R = ABCDE$ and

given functional dependencies are $\{A \rightarrow C, B \rightarrow C, C \rightarrow D, DE \rightarrow C, CE \rightarrow A\}$.

The relation R is decomposed into $R_1 = AD, R_2 = AB, R_3 = BE, R_4 = CDE, R_5 = AE$.

Q.3 Attempt any two parts of the following. **(2×5=10)**

(a) Define 2NF, 3NF, BCNF and explain each of them with suitable example.

(b) Define to differentiate between multivalued dependences and Inclusion dependences and explain them with suitable examples.

(c) Consider the following relation for a Bank:

Customer Record (Account Number, Holder Name, date of birth, age, address, Account Type, balance in account, Loan Amount, EMI of Loan, start date of loan, end date of loan)

An account holder can open only one account in the Bank. However, an account may be a joint account. An account holder may take more than one loans from the bank. Identify the functional dependencies in the relation given above. Normalise the relation up to BCNF. Make suitable assumptions if any.

Q.4 Attempt any two parts of the following. **(2×5=10)**

(a) Differentiate between the terms Transactions and Queries. Give a brief account of ACID properties of transactions.

(b) What is the relevance of serializability of schedules of concurrent transactions? Define conflict serializability, and view serializability of schedules and explain them with suitable examples.

(c) Write algorithms for testing I. Conflict serializability, ii. View serializability of schedules concurrent transactions. Trace both of the algorithms for the following schedule.

T1	T2	T3
Read(Q)		
	Write(Q)	
Write(Q)		
		Write(Q)

Q.5 Attempt any two parts of the following. **(2×5=10)**

(a) Explain two phase locking protocol for concurrency control of database transactions and differentiate between strict two phase locking protocol and rigorous two phase locking protocol.

(b) Explain a time stamp-based protocol for concurrency control of database transactions.

(c) Explain multiple-granularity locking protocol for concurrency control of database transactions.

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Subject Code BEC-32

Roll No. 2 0 2 0 0 2 1 0

B. Tech.

Even Semester

MAJOR EXAMINATION 2021 - 22

MICROPROCESSORS AND APPLICATION

Time: 3 Hrs. Max. Marks: 50

Note: Attempt all questions. Each question carries equal marks.

1. Attempt any five parts of the following: **(5× 2 = 10)**

(a) What is the need of flag register? Discuss the flag register of 8085 microprocessor.

(b) What are the different hardware interrupts available in 8085? How signals provided at particular interrupt inputs are recognize as valid interrupt signals? What are their priority orders?

(c) Draw the timing diagram of instruction STAX B. If processor is operating at 3 MHz, calculate its execution time.

(d) For an 8085-microprocessor having frequency of 3 MHz, calculate the delay of following subroutine program:

MVI A, 08H

MVI B, 02H

CMP B

CMA

What will be content of accumulator after executing above program.

(e) What is difference between instructions CALL and JMP? Also explain the function of following instructions:

(i)LHLD 16-bit (ii)SPHL (iii)XCHG(iv) DAA

(f) Discuss why the number of output ports in the peripheral-mapped I/O is restricted to 256 ports. In the peripheral-mapped I/O, can an input and an output port have same port address?

(g) Write an assembly language program based on 8085 to sort 10 numbers from memory location 2000H in the ascending order.

2. Attempt any two parts of the following: **(2× 5 = 10)**

(a) What are the silent features of 8086? Draw and explain the architecture of 8086.

(b) Draw and discuss the write cycle timing diagram of 8086 in maximum mode.

(c) Explain the concept of segmented memory. Discuss the physical address formation in 8086.

3. **Attempt any two parts of the following:** **(2× 5 = 10)**

(a) With examples, explain the 8086 branch instructions in detail.

(b) Explain the concept of Write an assembly language program based on 8086 to find out the number of even and odd numbers from a given series of 16 bit hexadecimal numbers:

C000H, 0A57H, C322H, 0957H and C91EH

(c) Write an 8086 ALP to add two 32 bit numbers stored in memory in consecutive locations. Explain your logic with a suitable example.

4. **Attempt any two parts of the following:** **(2× 5 = 10)**

(a) Interface an 8255 with 8085. Initialize port A as output port, B as input port and C as output port. Port A address should be 0740H.Write a program to sense the switch positions SW_0 - SW_7 connected at port B. The sensed pattern is to be display on port A, to which 8 LEDs are connected.

(b) Design the interface circuit for interfacing 8251 with 8085. Set the 8251 in asynchronous mode as a transmitter and receiver with even parity enabled, 2 stop bits,8-bit character length, frequency 160 kHz and baud rate 10 K.

(c) What is the need of 8253/8254 programmable timer/counter? What is the function of gate input? What are the modes of the 8253? Discuss the mode which generates the square wave.

5. **Attempt any two parts of the following:** **(2× 5 = 10)**

(a) What are the advantages of DMA controller data transfer over interrupt driven or program controlled data transfer? Why are DMA controlled data transfers faster? Draw and discuss the mode set register of 8257.

(b) Draw and discuss he architecture of 8259? How will you provide more than eight interrupt input lines to an 8085 based system?

(c) What is the need of ADC and DAC converters in a microprocessor-based system? How do we interface ADC/DAC with microprocessor? Discuss the various interfacing steps

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Subject Code BCS-16 Roll No. 2 0 2 0 0 2 1 0 8

B. Tech.

EVEN SEMESTER

MAJOR EXAMINATION 2021 - 2022

Theory Of Computation

Time: 3 Hrs. Max. Marks: 50

Note: Attempt all questions. Each question carries equal marks.

1. **Attempt any five parts of the following:** **(5× 2 = 10)**

(a) Explain NFA with epsilon transition by taking a suitable example.

(b) Explain Myhill-Nerode theorem by taking a suitable example.

(c) Explain the terms alphabet, string, language, and grammar by taking suitable examples.

(d) Describe in brief about the algebraic laws of regular expressions.

(e) Compare and Contrast between Moore and Mealy machines.

(f) Explain in brief about the Pumping Lemma for Regular expressions.

(g) Discuss in brief about applications and limitations of finite automata.

2. **Attempt any two parts of the following:** **(2× 5 = 10)**

(a) Give context free grammars that generate the following languages.

(i) $\{w \in \{0,1\}^* \mid w \text{ contains at least three 1's}\}$

(ii) $\{w \in \{0,1\}^* \mid w = w^R \text{ and } |w| \text{ is even.}\}$

(iii) $\{w \in \{0,1\}^* \mid \text{the length of } w \text{ is odd and the middle symbol is 0}\}$

(iv) $\{a^i b^j c^k \mid i, j, k \geq 0 \text{ and } i + j = k\}$

(v) $\{a^i b^j c^k \mid i, j, k \geq 0 \text{ and } i = j \text{ or } i = k\}$

(b) Remove useless productions from the context free grammar given below.

$S \rightarrow AB \mid a$, $A \rightarrow BC \mid b$, $B \rightarrow aB \mid C$, $C \rightarrow aC \mid B$

(c) Prove that the class of context free languages is closed under concatenation.

3. **Attempt any two parts of the following:** **(2× 5 = 10)**

(a) Design Pushdown Automata that accept the following languages on $\Sigma = \{0,1\}$,

(i) $L_1 = \{w \varepsilon \{0,1\}^* : w \text{ contains at least three } 1's\}$

(ii) $L_2 = \{ w : n_0(w) = n_1(w) + 1\}$

(b) Show that, acceptance by final state is equivalent to acceptance by empty stack in the context of Push Down Automata.

(c) Convert the following CFG, G = (V, T, P, S), where V = {S, T, X} , $\Sigma = \{a, b\}$, the start variable is S and the productions P are , S→ aTXb , T→XTS | ε and X → a | b to an equivalent PDA.

4. **Attempt any two parts of the following:** **(2× 5 = 10)**

(a) Design a Turing machine for a language L over the alphabet $\Sigma = \{0,1\}$, which is defined as follows. $L =$

$\{\text{The set of all strings with an equal number of } 0's \text{ and } 1's\}$

(b) Design a Turing machine for the language, $L = \{ a^n b^n c^n \mid n \geq 1 \}$

(c) Prove that the halting problem of Turing Machines is Undecidable.

5. **Attempt any two parts of the following:** **(2× 5 = 10)**

(a) Prove that, if a language L and its complement both are recursively enumerable then L is recursive as well.

(b) Explain Post's Correspondence Problem by taking a suitable example.

(c) Discuss about the basic primitive recursive functions and the operations defined on them.

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Subject Code - BCS-17

Roll No. 2 0 2 0 0 2 1 0 8 9

B. Tech.

EVEN SEMESTER

MAJOR EXAMINATION 2021 - 2022

COMPUTER ORGANIZATION & DESIGN

Time: 3 Hrs. **Max. Marks: 50**

Note: Attempt all questions. Each question carries equal marks.

1. **Attempt any five parts of the following:** **(5 × 2 = 10)**

(a) A processor that has carry, overflow and sign flag bits as part of its program status word (PSW) performs addition of the following two 2's complement numbers 11001101 and 10001001. After the execution of this addition operation, find out the status of the carry, overflow and sign flags.

(b) What is pipelining? Consider A nonpipelined system that takes 100 ns to process a task. The same task can be processed in a 6-segment pipeline with a clock cycle of 15s. Determine the speed up ratio of the pipeline for 100 tasks. What is maximum speedup ratio that can be achieved?

(c) The value of a float type variable is represented using the double-precision 64-bit floating point format IEEE-754 standard that uses 1 bit for sign, 11 bits for biased exponent and 52 bits for mantissa. A float type variable X is assigned the decimal value of −36.625. Find out the representation of X in hexadecimal notation.

(d) The content of the top of memory stack is 5320. The content of the stack pointer(SP) is 3560. A two-word call subroutine instruction is located in memory at address 1120 followed by the address field of 6720 at location 1121. What are the contents of PC, SP and the top of the stack-

I. Before the call instruction is fetched from the memory
II. After the call instruction is executed.
III. After the return from subroutine

(e) An instruction is stored at location 650 with its address field at location 652. The address field has value 500. A processor register R1 contains the number 300. Evaluate the effective address for following addressing modes-

I. Direct
II. Immediate
III. Relative
IV. Register Indirect
V. Indexed with R1 as Indexed Register
VI. Auto Increment
VII. Auto Decrement

(f) Design and explain briefly a common bus system for a computer having 3-registers each of 5 bits using multiplexer.

(g) Write the one-address code for below expression-

$$(A * B) + (C * D / E)$$

How many LOAD and STORE operations will be needed to evaluate above expression.

2. **Attempt any two parts of the following:** **(2 × 5 = 10)**

(a) Derive an algorithm in flowchart form for adding and subtracting two fixed point binary numbers when negative numbers are in signed 1's complement representation.

(b) Show that the division of two normalized floating-point numbers with fractional mantissa will always result in a normalized quotient provided a dividend alignment is carried out prior to the division process. Also explain the division process of two floating point numbers.

(c) Write the pseudocode for multiplication of two signed numbers and multiply -17 by -11 to show the process of multiplication.

3. **Attempt any two parts of the following:** **(2 × 5 = 10)**

(a) Show the contents of registers E, A, Q, and SC during the process of multiplication of 1110 by 1001 and 1111 by 1011.

(b) Explain Booths algorithm with the help of flowchart and explain its working by showing multiplication of -17 by -11. Also find out the number of addition and subtraction needed for the multiplying above numbers.

(c) Draw and explain the flowchart for addition and subtraction two floating point numbers. Explain with a sample example.

4. **Attempt any two parts of the following:** **(2 × 5 = 10)**

(a) Answer the following questions-

I. Consider a system with 4 level caches. Access times of Level 1 cache, Level 2 cache, Level 3 cache, Level 4 cache and main memory are 1 ns, 10ns, 20ns, 50ns and 500 ns, respectively. The hit rates of Level 1, Level 2 and Level 3 caches are 0.8, 0.85, 0.9 and 0.95 respectively. What is the average access time of the system ignoring the search time within the cache?

II. A 8-way set associative cache memory unit with a capacity of 32 KB is built using a block size of 8 words. The word length is 32 bits. The size of the physical address space is 4 GB. Calculate the number of bits for the TAG field and index.

(b) Explain the various cache mapping techniques with the sample example. Consider a direct mapped cache of size 32 KB with block size 32 bytes. The CPU generates 32-bit addresses. Find out the number of bits needed for cache indexing and the number of tag bits respectively.

(c) Explain the memory hierarchy in brief. Consider A computer uses RAM chips of 64 * 8 capacity and answer the below questions-

I. How many 64 x 8 RAM chips are needed to provide a memory capacity of 4096 bytes?

II. How many lines of the address bus must be used to access 4096 bytes of memory? How many of these lines will be common to all chips?

III. How many lines must be decoded for chip select? Specify the size of the decoders.

5. **Attempt any two parts of the following:** **(2 × 5 = 10)**

(a) A virtual memory system has an address space of 8K words, a memory space of 4K words, and page and block sizes of 1K words. The following page reference changes occur during a given time interval.

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

Determine the four pages that are resident in main memory after each page reference change if the replacement algorithm used is

I. FIFO

II. LRU

III. Optimal Page Replacement

(b) Describe DMA with suitable block diagram. Why does DMA have priority over the CPU when both request a memory transfer? Explain.

(c) Explain the various methods used for asynchronous data transfer with a suitable diagram.

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