| 2 | 0 | C | S | 0 | 4 | 6 |
|---|---|---|---|---|---|---|

# SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY, TUMKUR.

(A Constituent College of Sri Siddhartha Academy of Higher Education, Agalakote, Tumkur.)

## B.E., SEMESTER END EXAMINATION – FEB - MAR 2022

## CS3TH4 : DISCRETE MATHEMATICAL STRUCTURES

TIME: 3.00 Hrs SEMESTER : III MAX MARKS: 100

**NOTE: Answer any five full questions selecting one full question from each choice.**

| | | Marks |
|---|---|---|
| 1.a) | Define logical equivalence and verify compound propositions are logically equivalent or not by using laws of logic. $[p \wedge q \vee (7p \wedge 7q \wedge r)] \leftrightarrow (p \vee q \vee r)$ | 6 |
| b) | Write the Converse, Inverse and Contrapositive statements of "If I finish writing my computer program before lunch then I shall play tennis in the afternoon". | 6 |
| c) | Check the validity of the given argument<br>$p \rightarrow (q \rightarrow r)$<br>$pv \neg s$<br>$q$<br>---<br>Therefore: $s \rightarrow r$ | 8 |

**OR**

| | | |
|---|---|---|
| 2.a) | Define Tautology. Verify the given compound statement is a tautology or not using truth table $[(\neg p \vee \neg q) \rightarrow (p \wedge q \wedge r)] \leftrightarrow (p \wedge q)$ | 6 |
| b) | Find the i) truth value ii) negate the statement iii) dual of the statement<br>"If 3 + 4 = 12 then 3 + 2 + 6" | 6 |
| c) | Define an argument. With reasons check the validity of the given argument. "If the students arrived on time or the refreshments were not delivered on time, then the New year's party would have been canceled and Alicia would have been angry. If the party were canceled, then refunds would have been made. No refunds were made. Therefore the students must have arrived in time". | 8 |

| | | |
|---|---|---|
| 3.a) | Given, A = {1, 2, 3, 4} and R = {(1, 3), (1, 2), (3, 4), (4, 3)} and S = {(4, 1), (2, 3), (1, 4)} compute R°S, S°R, R°R, S°S. | 6 |
| b) | Define an equivalence relation. P. T. R is an equivalence relation defined as "x + y = even" on A = {2, 4, 5, 7, 10, 15}. Write M(R) and D(R). Find the partition induced by R on A. | 7 |
| c) | If A = {2, 4, 6, 8, 9, 10, 12} and R is defined as "exactly divides" Prove that R is partially ordered relation and Draw the Hasse's diagram representing the POSET (A, R). | 7 |

**OR**

| | | |
|---|---|---|
| 4.a) | Let \|A\| = 5. Find the following number of relations that are<br>i) Binary relations ii) reflexive relations iii) functions<br>iv) One – one functions v) onto functions on A. | 6 |
| b) | Find the number of onto functions from A to B if \|A\| = 7 to \|B\| = 4 and also using Stirling's number of second kind Evaluate S(4, 4), S(4, 1), S(6, 4). | 8 |
| c) | Draw the Hasse's diagram, representing positive divisors of 36. | 6 |

| | | |
|---|---|---|
| 5.a) | State Binomial theorem and Multinomial theorem.<br>Find the coefficient of $x^{10} y^5 z^5$ in the expansion of $(2x + 3y - 5z + 7)^{23}$. | 6 |

b) Define combination with repetitions.
Find the number of positive integer solutions of the expression
$X_1 + X_2 + X_3 + X_4 + X_5 < 30$ such that each $x_i \geq 3$. 6

c) i) Define the given sequence recursively and explicitly 3, 6, 11, 18, 27, .....
ii) Find how many distinct four digit integers one can make from the digits 1, 3, 3, 7.7.8. 7

**OR**

6.a) Solve the recursive definition for the sequence $\{a_n\}$ in the following cases:
i. $a_n = 5n$
ii. $a_n = 6^n$ 6

b) Find the number of permutations of the letters of the word "MASSASAUGA". Among them how many have (i) all A's together (ii) All S's are together. 7

c) Prove by Mathematical induction principle for all $n \geq 1$
$1/(1 \bullet 2)+1/(2 \bullet 3)+1/(3 \bullet 4)+.....+1/\{n(n+1)\} = n/(n+1)$ 7

7.a) Define Regular, Complete and Bipartite graph with an example for each. 6

b) Verify the following graphs exist or not
i) Complete graph with 20 vertices and 50 edges.
ii) 3-regular graph with 40 vertices 60 edges. 8

c) Prove that $K_5$ is a non-planar graph. 6

**OR**

8.a) Define Isomorphism. Prove the following graphs are isomorphic.

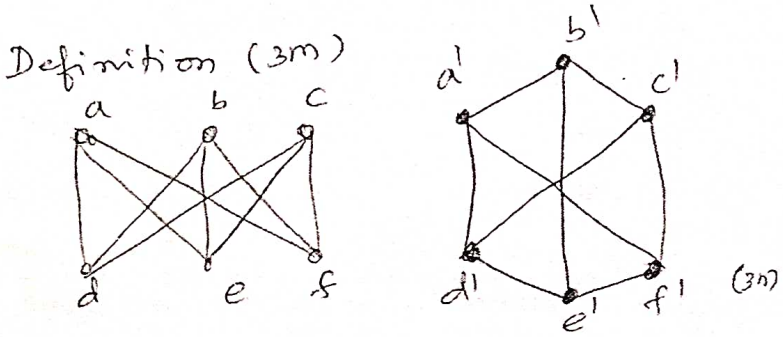


Fig. 8(a) 6

b) Define and find the chromatic number of the following graphs
i) A tree
ii) Complete graph $K_n$
iii) Bipartite graph $K_{4,7}$ 6

c) Determine the order $|V|$ of the graph $G = (V, E)$ in the following cases:
i. G has 10 edges with two vertices of degree 4 and all other degree 3
ii. G is regular with 15 edges 8

9.a) Let A = {100, 11}, B = {000, 1} be languages for the alphabet Σ = {0.1}. Determine AB, BA, $A^2$, $B^2$. 8

b) Design DFA with Σ = {0, 1} accepts even number of 0's and even number of 1's. 6

c) Convert the following ε-NFA to DFA.

| δ | ε | a | b | c |
|---|---|---|---|---|
| P→ | Φ | {p} | {q} | {r} |
| Q | {p} | {q} | {r} | Φ |
| *r | {q} | {r} | Φ | {p} |

6

1) Compute é –closure of each state
2) Convert the automata to DFA

**OR**

10.a) For the alphabet $\Sigma = \{0.1\}$, let A, B, C subsets of $\Sigma^*$ be the following languages
$A = \{0, 1, 00, 11, 000, 111, 0000, 1111\}$
$B = \{w \in \Sigma^* \text{ such that } 2 \leq ||w||\}$
$C = \{w \in \Sigma^* \text{ such that } 2 \geq ||w||\}$
Determine the following subsets of $\Sigma^*$ $A \cap B$, $A - B$, $A \Delta B$, $A \cap C$, BUC. 8

b) Design a FA with $\Sigma = \{0, 1\}$ accepts the strings with an even number of 0's followed by single 1. 6

c) By applying Lazy evaluation method convert the following NFA to DFA. 6

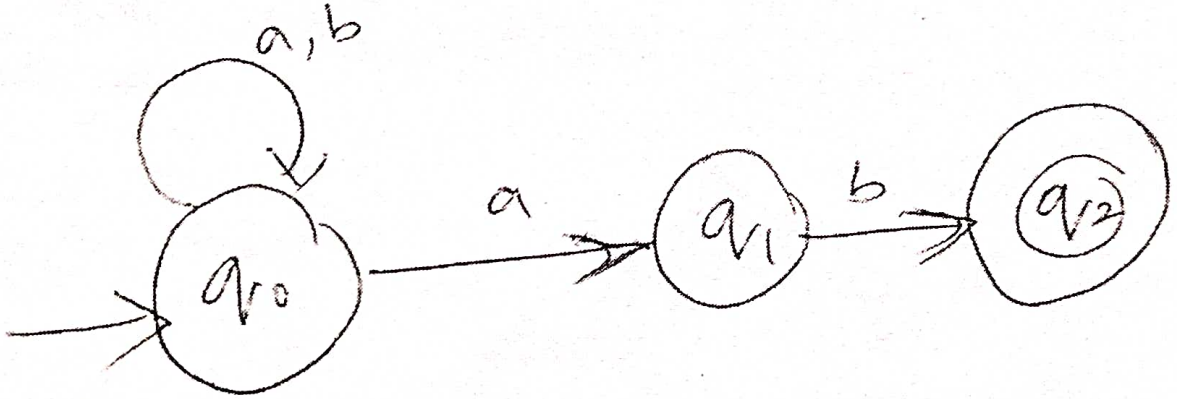


Fig.10(c)

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| 2 | 0 | C | S | 0 | 4 | 6 | | | |
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# SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY, TUMKUR.

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## B.E., SEMESTER END EXAMINATION – FEB - MAR 2022

## CS3TH5 : DIGITAL CIRCUIT DESIGN AND ITS APPLICATIONS

**TIME: 3.00 Hrs** **SEM: III** **MAX MARKS: 100**

**NOTE: Answer any five full questions selecting one full question from each choice.**

| | | Marks | CO | BL |
|---|---|---|---|---|
| 1.a) | Determine the minimal sum of the following Boolean functions.<br>(i) $f(a,b,c) = \prod M(2,4,7)$<br>(ii) $f(a,b,c) = \prod M(1,2,5,6,7)$ | 7 | 2 | 2 |
| b) | Determine all implicants and prime implicants of the function using K-map. $f(a,b,c,d) = \sum m(4,6,7,9,11,15)$ | 8 | 2 | 2 |
| c) | Write the procedure for obtaining prime implicants using Quine McCluskey algorithm. | 5 | 2 | 1 |
| | **OR** | | | |
| 2.a) | Simplify using K-map<br>i)Y=C'(A'B'D+CD')+D'<br>ii)f(p,q,r,s)=∑(1,3,5,6,9,11,12)+dc(4,10,15). | 7 | 2 | 2 |
| b) | Write a short note on expressions, operands and operators of data flow modelling in HDL. | 5 | 4 | 1 |
| c) | Determine all the prime implicants of the function $f(a,b,c,d) = \prod M(1,3,6,7,9,11,13,14)$ by applying QM algorithm on $\bar{f}$. | 8 | 2 | 2 |
| 3.a) | Realize full adder using 2:1 MUX | 6 | 2 | 2 |
| b) | Design BCD to decimal decoder using 2 to 4 decoders. | 6 | 2 | 2 |
| c) | Design 2 –bit comparator and describe its behavior in Verilog. | 8 | 4 | 2 |
| | **OR** | | | |
| 4.a) | Implement the following function using decoder having active low output and NAND gate.<br>(i)f1(a,b,c,D) = ∏ M(0,3,8,11,12,15)<br>(ii)f2(a,b,c,D) = ∏ M(1,2,7,811,12,14) | 7 | 2 | 2 |
| b) | Design a 4:1 MUX using Verilog code.. | 5 | 2 | 2 |
| c) | Design a 4-bit carry look ahead adder and explain its advantage over 4-bit ripple binary adder. | 8 | 2 | 2 |
| 5.a) | With circuit explain the working of JK flipflop and derive the characteristic equation. | 7 | 2 | 3 |
| b) | Design a 3 bit synchronous up counter using T-flipflops. Draw the necessary function table, excitations and waveforms. | 8 | 2 | 3 |
| c) | Write a Verilog code for JK flipflop | 5 | 4 | 2 |
| | **OR** | | | |
| 6.a) | With a neat diagram explain the operation of 4 –bit universal shift registers. | 7 | 2 | 3 |
| b) | Design a synchronous counter to sequence 0 →1→ 4 → 6 → 7 → 5 → 0 using positive edge triggered JK flip flops with minimal combinational gating. | 8 | 2 | 3 |
| c) | Write a Verilog code for D flipflop. | 5 | 4 | 3 |

| | | | | |
|---|---|---|---|---|
| 7.a) | What is Arduino Uno? Explain the functional components of Arduino Uno. | 10 | 1 | 1 |
| b) | Explain the procedure to implement Arduino development system for a simple Arduino "Hello World" program with a LED | 10 | 1 | 1 |
| | **OR** | | | |
| 8.a) | What is Raspberry Pi 3? Explain the hardware components of Raspberry Pi 3. | 10 | 1 | 1 |
| b) | Explain the procedure for a simple Raspberry Pi "Hello World" program with a LED | 10 | 1 | 1 |
| 9.a) | With necessary equations and diagrams, explain the working of TMP36 temperature sensor. | 6 | 3 | 1 |
| b) | Write a program for Arduino infrared motion detector alarm. | 8 | 3 | 1 |
| c) | Write a program for Arduino soil moisture detector | 6 | 3 | 1 |
| | **OR** | | | |
| 10.a) | With necessary steps, explain how DTH11 can be used to measure temperature and humidity. | 10 | 3 | 1 |
| b) | Write a program for Raspberri Pi infrared motion detector alarm. | 10 | 3 | 1 |

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## B.E., SEMESTER END EXAMINATION – FEB -MAR 2022

## CS3TH6 : COMPUTER ORGANIZATION

**TIME: 3.00 Hrs** **SEMESTER : III** **MAX MARKS: 100**

**NOTE: Answer any five full questions selecting one full question from each choice.**

| | | Marks | CO | BL |
|---|---|---|---|---|
| 1.a) | With a neat diagram explain the connection between the processor and the computer memory. | 8 | 1 | 2 |
| b) | What is the effective address of the source operand in each of the following instructions, when the register R1 and R2 of computer contains the decimal value 1200 and 4600?<br>(i) Load 20(R1), RS<br>(ii) Move #3000, RS<br>(iii) Add –(R2), R5<br>(iv) Subtract (R1)+, R3 | 6 | 4 | 3 |
| c) | Explain the following:<br>(i) Byte addressability<br>(ii) Big-endian assignment<br>(iii) Little-endian assignment | 6 | 1 | 2 |
| | **OR** | | | |
| 2.a) | What is performance measurement? Explain the overall SPEC rating for the computer in a program suite. | 6 | 4 | 2 |
| b) | Write a program to evaluate the arithmetic statement Y = (A+B) * (C-D) using three address, two-address, one-address and zero - address instruction. | 8 | 4 | 3 |
| c) | Write an assembly language program to add N numbers stored in a connective memory location as Num1, Num2 ….. Numn and store the result at location sum by using branching technique. | 6 | 4 | 3 |
| 3.a) | Discuss any four types of addressing modes with suitable examples. | 8 | 1 | 2 |
| b) | Write the possible control sequence for execution of a complete instruction sub (R3), R1 in a single bus processor. | 6 | 1 | 3 |
| c) | Explain the concept of stack frames, when subroutines are nested. | 6 | 1 | 2 |
| | **OR** | | | |
| 4.a) | With a neat diagram explain multiple bus organization of CPU and write the central sequence for the instruction Add R4, R5, R6 for the multiple bus organization. | 12 | 1 | 2 |
| b) | Compare and contrast Hardwired control unit with Micro programmed control unit | 8 | 1 | 2 |
| 5.a) | Mention advantages of Booth multiplication algorithm. Apply Booth's multiplication to multiply the signed numbers -5 and 4. | 8 | 3 | 3 |
| b) | Perform the division operation 11 ÷ 2 using Non – restoring division method. | 6 | 3 | 3 |
| c) | Discuss IEEE standard for floating point numbers. | 6 | 3 | 2 |
| | **OR** | | | |

| | | | | |
|---|---|---|---|---|
| 6.a) | Apply bit-pair recoding of multiplier technique to multiply +13 and -6. | 6 | 3 | 3 |
| b) | With a neat diagram explain the circuit arrangement for binary division. | 8 | 3 | 2 |
| c) | Perform the division operation for 10 ÷ 3 using restoring division method. | 6 | 3 | 3 |
| 7.a) | What is an interrupt? Discuss interrupt service routine with an example. | 6 | 2 | 2 |
| b) | Differentiate between serial and parallel port communication. | 4 | 2 | 2 |
| c) | Explain the following:<br>(i) USB Architecture<br>(ii) USB Addressing | 10 | 2 | 2 |
| | OR | | | |
| 8.a) | What is bus architecture? With a neat diagram explain distributed bus arbitration. | 7 | 2 | 1 |
| b) | Illustrate the 8-bit parallel processing with a neat diagram. | 7 | 2 | 1 |
| c) | Discuss how a read operation is performed in a PCI bus. | 6 | 2 | 2 |
| 9.a) | With a neat diagram, explain the internal organization of a 2M x 8 dynamic memory chip. | 8 | 2 | 2 |
| b) | Explain direct mapping and set associative mapping technique. | 6 | 2 | 2 |
| c) | Discuss different type of read only memory. | 6 | 2 | 2 |
| | OR | | | |
| 10.a) | Draw and discuss the organization of 1 K x 1 memory chip. | 6 | 2 | 2 |
| b) | With a neat diagram, explain how virtual memory address is translated. | 8 | 2 | 2 |
| c) | Compare static memory with dynamic memory. | 6 | 2 | 2 |

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| 2 | 0 | C | S | 0 | 4 | 6 |
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## B.E., SEMESTER END EXAMINATION – FEB - MAR 2022

## MA3CS1/MA3IS1 : STATISTICS &PROBABILITY

**TIME: 3.00 Hrs** **SEMESTER : III** **MAX MARKS: 100**

**NOTE: Answer any five full questions selecting one full question from each choice.**

| | | Marks | CO | BL |
|---|---|---|---|---|
| 1.a) | Find the equation of best fitting straight line for the data | 6 | 1 | 1 |

| x | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| y=f(x) | 9 | 8 | 24 | 38 | 26 | 20 |

b) Fit a polynomial $y = a_0 + a_1x + a_2x^2$ for the following data: 7 1 3

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| y=f(x) | 1 | 1.8 | 1.3 | 2.5 | 6.3 |

c) Obtain the lines of regression and hence find the co-efficient of correlation for the data 7 1 1

| x | 1 | 3 | 4 | 2 | 5 | 8 | 9 |
|---|---|---|---|---|---|---|---|
| y | 8 | 6 | 10 | 8 | 12 | 16 | 16 |

**OR**

2.a) Fit a parabola of second degree $y = Ax^2 + Bx + c$ in the least square sense for the following data and hence estimate y at x=6 6 1 3

| x | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| y=f(x) | 10 | 12 | 13 | 16 | 19 |

b) Two regression lines are x=19.3 – 0.87y and y=11.64 – 0.5x. Find the means of x and y and find the coefficient of correlation. 7 1 1

c) Fit a least square geometric curve $y=ax^b$ from the following data: 7 1 3

| x | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| y=f(x) | 0.5 | 2 | 4.5 | 8 | 12.5 |

3.a) The probability distribution of a finite random variable X is given by the following table: 6 2 1

| x | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| f(x) | 0.1 | k | 0.2 | 2k | 0.3 | k |

Find the value of k, mean and variance.

b) When a coin is tossed four times, find the probability of getting (i) exactly one head (ii) atmost three heads (iii) atleast two heads. 7 2 1

c) If 2% of the fuses manufactured by a firm are found to be defective. Find the probability that a box containing 200 fuses contains (i) no defective fuses (ii) three or more defective fuses 7 2 1

**OR**

4.a) The number of telephone lines busy at an instant of time is a binomial variate with probability 0.1 that a line is busy. If 10 lines are chosen at random. What is the probability that (i) no lines are busy (ii) all lines are busy (iii) atleast one line is busy (iv) atmost two lines are busy. 6 2 1

b) Find the value of k such that the following distribution represents a finite probability distribution, hence find its mean and standard deviation. 7 2 1

| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| p(x)=y | k | 2k | 3k | 4k | 3k | 2k | k |

c) In a test on electrical bulbs, it was found that life time of a particular brand was distributed normally with an average life of 2000 hours and standard deviation of 60 hours. If a firm purchases 2500 bulbs find the number of bulbs that are likely to lost for (i) more than 2100 hours (ii) less than 1950 hours (iii) between 1900 to 2100 hours. Given $\phi(1.67)=0.4525$, $\phi(0.83)=0.2967$. 7 2 1

5.a) Define: i) Population ii) Sampling distribution iii) Standard error. 6 4 1

b) A population consists of first numbers 2,3,6,8,11. Consider all possible samples of size 2 which can be drawn with replacement from this population. Find 7 4 1
   (a) The mean and standard deviation of the population
   (b) The mean and standard deviation of the sampling distribution.

c) A coin is tossed 1000 times and then turns up 540 times. Decide on the hypothesis that the coin is unbiased at 0.01 level of significance. 7 4 5

**OR**

6.a) Ten individuals are chosen at the random from a population and their heights in inches are found to be 63,63,66,67,68,69,70,70,71,71. Test the hypothesis that the mean height of the universe is 66 inches ($t_{0.05}=2.262$ for 9d.f) 6 4 6

b) A die is thrown 264 times and the number appearing on the face(x) follows the following frequency distribution: 7 4 1

| x | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| f | 40 | 32 | 28 | 58 | 54 | 60 |

Calculate the value of $\chi^2$.

c) A sample of 900 days was taken in a coastal town and it was found that on 100 days the weather was very hot. Obtain the probable limits of the percentage of very hot weather. 7 4 2

7.a) Define: i) Probability vector ii) Stochastic matrix iii) Regular stochastic matrix. 6 1 1

b) Find the unique fixed probability vector of a regular stochastic matrix 7 1 1

$$A = \begin{bmatrix} 3/4 & 1/4 \\ 1/2 & 1/2 \end{bmatrix}$$

c) A man smoking habits are as follows. If he smoker filter cigarettes one week, the switches to non-filter cigarettes the next week with probability 0.2. on the other hand , if he smokes non filter cigarettes one week there is a probability of 0.7 that he will smoke non filter cigarettes the next week as well. In the long run how often does he smoke filter cigarettes? 7 1 1

**OR**

**8.a)** Explain state transition diagram of a markov chain. Write the state transition diagram of the following transition probability matrix P. Also verify that P is irreducible $P = \begin{bmatrix} 1/4 & 1/2 & 1/4 \\ 1/3 & 0 & 2/3 \\ 1/2 & 0 & 1/2 \end{bmatrix}$ 6 1 2

b) A self-service store employ has one cashier at its counter. 9 customer arrive on an average every 5 minutes. While the cashier can serve 10 customers in 5 minutes. Assuming poisson distribution for arrival rate and exponential distribution for service rate. Find, 7 4 1

i) Average number of customers in the system
ii) Average queue length
iii) Average time a customer spends in the system
iv) Average time a customer waits before being served.

c) The transition probability matrix of markov chain is given by $P = \begin{bmatrix} 1/2 & 0 & 1/2 \\ 1 & 0 & 0 \\ 1/4 & 1/2 & 1/4 \end{bmatrix}$ and the initial probability distribution is $P(0) = \left(\frac{1}{2}, \frac{1}{2}, 0\right)$. Find $P_{13}^{(2)}, P_{23}^{(2)}$ *and* $P_1^{(2)}$. 7 1 1

**9.a)** Define: (i) Independent random variable (ii) Marginal probability distributions of X and Y (iii) Covariance. 6 2 1

b) If X and Y are independent random variables with the following distribution: 7 2 1

| $x_i$ | 2 | 5 | 7 |
|---|---|---|---|
| $f(x_i)$ | 1/2 | 1/4 | 1/4 |

| $y_j$ | 3 | 4 | 5 |
|---|---|---|---|
| $g(y_j)$ | 1/3 | 1/3 | 1/3 |

i) Find the join probability distribution of X and Y.
ii) Show that the covariance of X and Y is equal to zero.

c) The joint probability distribution of two discrete random variables X and Y is given by f(x,y)=k(2x+y) where x and y are integers such that $0 \leq x \leq 2,\ 0 \leq y \leq 3$ 7 2 1

i) Find the value of constant k
ii) Find the marginal probability distribution of x and y
iii) Show that the random variables X and Y are dependent.

**OR**

10.a) The following figures relate to the production in Kgs of 3 varieties A,B,C of wheat grown in 12 plots 10 3 4

$A$ : 14 16 18
$B$ : 14 13 15 22
$C$ : 18 16 19 19 20

Make an analysis of variance using F-test to examine whether there is any significant different in the production of the varieties values of $F_{0.05}$ at (2,9) degrees of freedom is 4.26.

b) The joint probability distributions of two random variables X and Y is as follows: 10 2 1

| Y / X | -2 | -1 | 4 | 5 |
|---|---|---|---|---|
| 1 | 0.1 | 0.2 | 0 | 0.3 |
| 2 | 0.2 | 0.1 | 0.1 | 0 |

Determine the marginal probability distributions of X and Y. Compute E(X), E(Y), E(XY) and COV(XY).

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| 2 | 0 | C | S | 0 | 0 | 1 | | | |
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## B.E. SEMESTER END EXAMINATION – FEB - MAR 2022

### CS3TH2 : OBJECT ORIENTED PROGRAMMING

**TIME: 3.00 Hrs** **SEMESTER : III** **MAX MARKS: 100**

**NOTE: Answer any five full questions selecting one full question from each choice.**

| | | Marks | CO | BL |
|---|---|---|---|---|
| 1.a) | Explain concepts of object oriented programming:<br>(i) Objects and classes<br>(ii) Data abstraction and encapsulation | 10 | 1 | 2 |
| b) | Identify the keywords in the below program and explain their significance.<br>class example:<br>{<br>Public static void main (string [ ] arls)<br>{<br>System.out.println ("Hello! World");<br>}<br>} | 10 | 1 | 3 |
| | **OR** | | | |
| 2.a) | List any five benefits and five applications of object oriented programming. | 10 | 1 | |
| b) | Explain the steps involved in implementing a Java-Application program with schematic diagram and example where ever necessary. | 10 | 1 | |
| 3.a) | Illustrate the usage of classes, objects, constructors and methods through a program. | 10 | 1 | |
| b) | Explain final variables, final classes and final methods and finalizer methods with examples. | 10 | 2 | |
| | **OR** | | | |
| 4.a) | Define method overloading.<br>Write a java program to overload a method called area ( ).Test the program. | 10 | 2 | |
| b) | How do you achieve runtime polymorphism in hierarchical inheritance? Illustrate through a program. | 10 | 2 | |
| 5.a) | Define a package. How does the java run-time system know where to look for packages that you create? Create a user defined package. | 10 | 2 | |
| b) | interface intstack<br>{<br>void push (int item);<br>int pop ( )<br>}<br>Write a program to implement the above interface to perform stack operations. | 10 | 2 | |
| | **OR** | | | |
| 6.a) | Explain the four categories of visibility for class members with respect to three access modifiers private, public and protected. Give code example for subclasses in the same package category. | 10 | 2 | |

| | | | | |
|---|---|---|---|---|
| b) | Public interface MyIf<br>{<br>int getnumber ( );<br>default string getstring ( )<br>{<br>return "default string";<br>}<br>}<br>Write a program to implement the above interface. | | 10 | 2 |
| 7.a) | Explain exception handling in Java. Write a Java program to illustrate exception handling. | | 10 | 3 |
| b) | List and explain generic restrictions with examples. | | 10 | 3 |
| | | **OR** | | |
| 8.a) | What are generics? Write a Java program to illustrate A generic class with two type parameters. | | 10 | 3 |
| b) | Illustrate the concept of throwing an exception explicitly and usage of multiple catch clauses through a program. | | 10 | 3 |
| 9.a) | Illustrate the usage of read ( ) and readLine ( ) methods to read characters and string from the keyboard and display. | | 10 | 4 |
| b) | Explain printWriter class and its methods with example. | | 5 | 4 |
| c) | Write a program to show the usage of write ( ) method that can be used to write to the console. | | 5 | 4 |
| | | **OR** | | |
| 10.a) | Write a Java program that uses read ( ) to input and display the contents of a file that contains ASCII text. | | 10 | 4 |
| b) | Explain any two Byte Stream classes and its methods with their functionality. | | 10 | 4 |

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| 2 | 0 | C | 5 | 0 | 5 | 1 | |
|---|---|---|---|---|---|---|---|

# SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY, TUMKUR.

(A Constituent College of Sri Siddhartha Academy of Higher Education, Agalakote, Tumkur.)

## B.E., SEMESTER END EXAMINATION – FEB - MAR 2022

## CS3TH3 : DATA STRUCTURES

**TIME: 3.00 Hrs** **SEMESTER : III** **MAX MARKS: 100**

**NOTE: Answer any five full questions selecting one full question from each choice.**

| | | Marks | CO | Bl. |
|---|---|---|---|---|
| 1.a) | Write a C program to implement queue using array of size 5. Show extreme conditions. | 10 | 2 | 2 |
| b) | Describe memory allocation functions. Give syntax and an example for each. | 10 | 1 | 1 |
| | **OR** | | | |
| 2.a) | What is postfix expression? Develop a C code to convert the given infix expression to postfix expression. | 10 | 4 | 3 |
| b) | Define Recursion. Give a recursive function to: (i) Solve tower of Hanoi problem (ii) find a key element in an array using binary search. | 10 | 3 | 3 |
| 3.a) | State the basic functionality of a circular queue? Develop a C function to insert, delete and display the elements in a circular queue. | 10 | 3 | 2 |
| b) | Explain the following with examples:<br>(i) Priority queues<br>(ii) Header node. | 10 | 1 | 1 |
| | **OR** | | | |
| 4.a) | Write a C program to create two linked list and join them to become one list. Display the node information before joining and after joining. | 10 | 3 | 3 |
| b) | Implement stack using singly linked list. Show full and empty conditions. | 10 | 3 | 2 |
| 5.a) | Why circular list is more efficient? Write a C functions to :<br>(i) Insert at rear end<br>(ii) Insert at front end<br>(iii) Delete based on information<br>(iv) Display the node information | 10 | 3 | 3 |
| b) | Using circular doubly linked list, give a single piece of code to delete a particular node based on the given information, which has to satisfy the following condition:<br>(i) If the node information is at the front end<br>(ii) If the node information is at the rear end<br>(iii) If the node information is in between front end and rear end<br>(iv) If the node information is not in the list | 10 | 3 | 3 |
| | **OR** | | | |
| 6.a) | Write a C functions to perform the following operations on doubly linked list:<br>(i) Create a new node<br>(ii) Insert a new node to the left of a specified information in the list<br>(iii) Insert a new node to the right of specified information in the list.<br>(iv) Delete a node based on the information. | 10 | 3 | 3 |
| b) | Implement queue using doubly linked list. | 10 | 3 | 2 |

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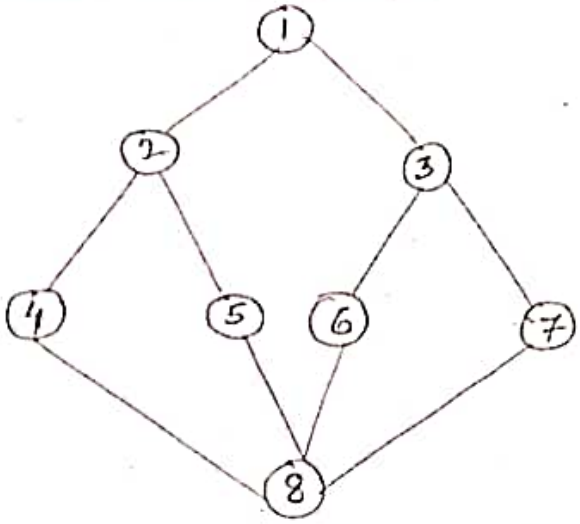
| 7.a) | Construct a binary search tree for the following sequence:<br>50, 28, 198, 78, 41, 18, 86, 35, 22, 54, 49<br>Also find all three traversal for the constructed tree. | 10 | 2 | 3 |
| b) | What is general tree? How it is different from binary tree? Explain how general tree is converted in to binary tree with an example. | 10 | 1 | 1 |

**OR**

| | | | | |
|---|---|---|---|---|
| 8.a) | Write a C program to construct binary search tree and performing all three traversals, using doubly linked list. | 10 | 3 | 3 |
| b) | Construct an expressions tree for the given expression:<br>((6+(3-2) * 5) ^ 2+3)<br>Find Postfix Expressions and evaluate it. | 10 | 4 | 3 |
| 9.a) | Write a procedure to perform depth first search traversal and breadth first search traversal. Find DFS and BFS traversals for the given graph. | 10 | 2 | 3 |




| | | | | |
|---|---|---|---|---|
| b) | Define transitive closure of a directed graph. Find the same for the following adjacent matrix. | 10 | 1 | 2 |

**OR**

| | | | | |
|---|---|---|---|---|
| **10.** | Explain the following:<br>(i) Lexical search<br>(ii) Tries<br>(iii) Transitive closure<br>(iv) Graph terminologies | 20 | 1 | 1 |

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# CS3TH3 Q. 9(b)

| | $a$ | $b$ | $c$ | $d$ |
|---|---|---|---|---|
| $a$ | 0 | 1 | 1 | 0 |
| $b$ | 0 | 0 | 1 | 1 |
| $c$ | 0 | 0 | 0 | 0 |
| $d$ | 0 | 0 | 1 | 0 |