

Total No. of printed pages = 3

CSE 181303

Roll No. of candidate

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2021

B.Tech. 3rd Semester End-Term Examination

CSE

DIGITAL SYSTEMS

(New Regulation)

(w.e.f. 2017-2018)

(New Syllabus)

(w.e.f. 2018-2019)

Full Marks - 70

Time - Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any four from the rest.

1. Answer the following (MCQ/Fill in the blanks) $(10 \times 1 = 10)$
- In a 2 input NAND gate if one of the input is permanently connected to Logic 0, the output will be _____
 - An AND gate becomes _____ gate when used with negative logic
 - Bubbled OR gate is equal to _____ gate.
 - On Karnaugh map grouping of 0's produces _____
 - SOP expression
 - POS expression
 - Non simplified expression
 - Not allowed
 - A 6 bit DAC has a step size of 50 mV What will be the full scale output voltage?
 - 5V
 - 3.15V
 - 3.2 mV
 - 50 mV

[Turn over

(vi) Which of the following is an Analog to digital converter

- (a) Successive Approximation
- (b) Flash type
- (c) Weighted resistor/converter
- (d) Both (a) and (b)

(vii) Define Fan-out?

(viii) State De-Morgan's theorem.

(ix) Which logic family is the fastest of all the logic families?

(x) What is MOD of a counter?

2. (a) Do the following conversions (4)

- (i) $(89.325)_{10}$ to binary $(101101.0101)_2$
- (ii) $(543.621)_8$ to hexadecimal $(11F.9E)_{16}$
- (iii) Binary $(110010100)_2$ to Gray 1010
- (iv) $(FAC.4B)_{16}$ to Binary

(b) Do the following arithmetic $(2 \times 4=8)$

- (i) Given the two binary numbers $X = 1010100$ and $Y = 1100101$. Find $X-Y$ using 2's complement.
- (ii) Add the numbers in BCD: $171 + 188$

(c) For $(292)_{10}$ $(1204)_b$, determine the base b. (3)

3. (a) Using Boolean algebra simplify the following expression. (4)

$$F = A[B + \overline{C}(\overline{AB} + \overline{AC})]$$

- (b) Convert $Y = ABC + AC + AB$ to standard SOP. Also find its corresponding POS. (6)
- (c) Simplify using K-map: $Y = \Sigma m(1,3,7,8,12,13) + d(0,2,9,11,14,15)$ (5)

4. (a) State the difference between combinational circuit and sequential circuit. (2)

- (b) Design a full subtractor circuit. (5)
- (c) Design 16:1 MUX using 4:1 MUX. (4)
- (d) Implement the following function using 3 to 8 line decoder.
 - (i) $F(A,B,C) = \Sigma m(0,2,5,6,7)$
 - (ii) $F(X,Y,Z) = \prod M(0,1,4,5)$

- (a) State the differences between latches and flip flops. (3)
- (b) What is Race around condition? With a neat diagram explain the working of Master Slave JK flip flop? (2+5)
- (c) Describe the operation of 4 bit bidirectional shift register. (5)
- (a) What do you mean by synchronous and asynchronous counters? (2)
- (b) Design and implement MOD-6 asynchronous counter using T flip flop. (5)
- (c) Design a synchronous counter that goes through the states 0,3,5,6,0.....(8)

Write short notes on any *three* (3 × 5 = 15)

- (a) R-2R Ladder D/A converter
- (b) CMOS NAND
- (c) ROMS and applications
- (d) PAL and PLA
- (e) 4 bit even and odd parity generator.

Total No. of printed pages = 6

MA 181301B

Roll No. of candidate

1 | 8 | 0 | 7 | 1 | 0 | 0 | 0 | 7 | 0 | 1 | 9

2021

B.Tech. 3rd Semester End-Term Examination

ECE, ETE, CSE

MATHEMATICS III - B

(New Regulation)

(w.e.f. 2017-2018)

(New Syllabus)

(w.e.f. 2018-2019)

Full Marks - 70

Time - Three hours

The figures in the margin indicate full marks
for the questions.

(Answer question No. 1 and any four from the rest.)

1. Choose the correct answer: $(10 \times 1 = 10)$

(i) An integer is chosen from 2 to 15. What is the probability that it is prime?

(a) $\frac{4}{7}$

(b) $\frac{3}{7}$

(c) $\frac{2}{7}$

(d) $\frac{1}{7}$

[Turn over

(ii) Let A and B be two events such that $P(B)=1$, then $P(A/B)$ is _____

- (a) $P(A)$
- (b) $P(B)$
- (c) $P(A \cap B)$
- (d) $P(A \cup B)$

(iii) For a random variable X which of the following is false?

- (a) $0 \leq F_X(x) \leq 1$
- (b) $F_X(\infty) = 1$
- (c) $P(a < X \leq b) = F_X(b) - F_X(a)$
- (d) $F_X(x) = P(X \geq x)$

(iv) If X is a continuous random variable with probability density function

$$f_X(x) = \begin{cases} Kx^2 & \text{for } 0 < x < 3 \\ 0 & \text{otherwise} \end{cases} \text{ Then the value of } K \text{ is } _____$$

- (a) $\frac{2}{9}$
- (b) $\frac{1}{9}$
- (c) $\frac{4}{9}$
- (d) $\frac{5}{9}$

(v) If X is a continuous random variable with probability density function

$$f_X(x) = \begin{cases} \frac{1}{2}x & \text{for } 0 < x < 2 \\ 0 & \text{otherwise} \end{cases} \text{ Then } E(X) \text{ is } _____$$

- (a) 1
- (b) 0
- (c) 2
- (d) 3

- (vi) The frequency curve which is symmetrical about its mean is known as
- Platykurtic
 - Mesokurtic
 - Leptokurtic
 - None of these

- (vii) Which of the vector is a probability vectors?

- $\left(\frac{1}{4}, \frac{3}{2}, -\frac{1}{4}, \frac{1}{2}\right)$
- $\left(\frac{5}{2}, 0, \frac{8}{3}, \frac{1}{6}, \frac{1}{6}\right)$
- $\left(\frac{1}{12}, \frac{1}{2}, \frac{1}{6}, 0, \frac{1}{4}\right)$
- $\left(\frac{3}{13}, \frac{2}{13}, -\frac{1}{6}, 0, \frac{1}{5}\right)$

- (viii) The joint probability mass function of two random variables X and Y is

$$P_{X,Y}(x, y) = \begin{cases} \frac{1}{21}(x+y) & \text{for } x=1,2 \text{ and } y=1, 2, 3 \\ 0 & \text{otherwise} \end{cases} \quad \text{The } P_X(1) = \text{_____}$$

- $\frac{3}{8}$
- $\frac{3}{7}$
- $\frac{5}{6}$
- $\frac{1}{4}$

- (ix) 2% of the items produced by a firm are defective. If a box contains 100 items, then the variance is _____

- 2
- 3
- 1
- 4

(x) If θ be the angle between the lines of regression of the variables X and y , then the lines of regression are perpendicular to each other if _____

(a) $\tan \theta = \frac{\pi}{2}$

(b) $\sin \theta = \frac{\pi}{2}$

(c) $\tan \theta = \infty$

(d) $\sin \theta = 0$

2. Answer the following:

(a) A bag contains 6 white, 3 red and 9 black balls. Three balls are drawn one by one with replacement. What is the probability that at least one is white? (5)

(b) State and prove Baye's Theorem. (1+4=5)

(c) The probability density function of a random variable X is $f_X(x) = \frac{1}{2} e^{-\frac{x}{2}}$ for $-\infty < x < \infty$. Find the cumulative distribution function of X . (5)

3. Answer the following:

(a) The probability mass function of a random variable X is

$$p_X(x) = \begin{cases} K^x & \text{for } x = 1, 2, \dots \\ 0 & \text{otherwise} \end{cases}, \text{ where } K \text{ is a constant.}$$

Find moment generating function of X . Hence evaluate mean of X . (3+2=5)

(b) How many tosses of a fair coin are needed so that the probability of getting at least one head is 87.5%? (5)

(c) Using the least square method fit a straight line to the four points $(-1.0, 1.000), (-0.1, 1.099), (0.2, 0.808), (1.0, 1.000)$. (5)

4. Answer the following :

- (a) In a normal distribution, 7% of the items are under 35 and 89% of the items are under 63. What is the mean and standard deviation of the distribution? (5)
- (b) The first four moments of a distribution about the value 4 of the variable are -1.5, 17, -30 and 108. Calculate measure of skewness and measure of kurtosis, and comment upon the nature of the frequency distribution. (5)
- (c) If the random variables Y, X_1 and X_2 are defined as $Y = aX_1 + bX_2$, where a and b are constants, find variance of Y . (5)

5. Answer the following :

- (a) The joint probability mass function of two random variables X and Y is

$$P_{X,Y}(x,y) = \begin{cases} \frac{1}{42}(2x+y), & \text{for } x=0, 1, 2 \text{ and } y=0, 1, 2, 3 \\ 0, & \text{otherwise} \end{cases}$$

Find $P_Y(y/2)$. Hence, find $P(Y=1/X=2)$. (3+2=5)

- (b) Find the unique fixed probability vector t of $P = \begin{bmatrix} 0 & \frac{3}{4} & \frac{1}{4} \\ \frac{1}{2} & \frac{1}{2} & 0 \\ 0 & 1 & 0 \end{bmatrix}$ (5)

- (c) Show that the Poisson distribution is the limiting form of the Binomial distribution. (5)

6. Answer the following :

- (a) The joint probability density function of X and Y is

$$f_{X,Y}(x,y) = \begin{cases} 4xye^{-(x^2+y^2)}, & \text{for } 0 \leq x < \infty \text{ and } 0 \leq y < \infty. \\ 0, & \text{otherwise} \end{cases}$$

Show that X and Y are independent. (5)

- (b) The marks secured by recruits in the selection test (X) and in the proficiency test (Y) are given below:

Sl.No.	1	2	3	4	5	6	7	8	9
X	10	15	12	17	13	16	24	14	22
Y	30	42	45	46	33	34	40	35	39

Calculate the rank correlation coefficient. (5)

- (c) Let two dice be thrown at random. Let X be the discrete random variable that assigns to each point (a, b) the maximum of its numbers. Find the cumulative distribution function of X . (5)
7. Answer the following :
- (a) The theory predicts the proportion of beans in four groups G_1, G_2, G_3 and G_4 should be in the ratio 9:3:3:1. In an experiment with 1600 beans the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory? (5)
- (b) Find the regression line of Y on X if $n = 5$, $\Sigma x = \Sigma y = 15$, $\Sigma x^2 = \Sigma y^2 = 49$ and $\Sigma xy = 44$. (5)
- (c) Consider a two-state Markov chain with the transition probability matrix $P = \begin{bmatrix} 1-a & a \\ b & 1-b \end{bmatrix}$ for $0 < a < 1$ and $0 < b < 1$. Find the n -step transition probability matrix P^n . (5)

Total No. of printed pages=1

MC181306

Roll No. of candidate 180710004019

2021

B. Tech. 3rd Semester End-Term Examination

All Branch

CONSTITUTION OF INDIA

(New Regulation w.e.f. 2017-18) &

(New Syllabus w.e.f. 2018-19)

Full Marks-100

Time - Three hours

All figures in the margin indicate full marks for the question.

Answer any 7 seven question.

- 1 What do you mean by Preamble of Indian Constitution? (10)
- 2 Explain the role of State Election Commission of India. (10)
- 3 What do you mean by the Fundamental rights of Indian Constitution? (10)
- 4 Explain the role of Directive Principle of State policy. State its principles. (10)
- 5 Write down about the role of Election Commission of India. (10)
- 6 Explain the role of Panchayati Raj system in India. (10)
- 7 What do you mean by History of Indian Constitution? (10)
- 8 What do you mean by Democracy of Indian Constitution? Write down its salient features. (10)
- 9 Explain the role of Rajya Sabha. State its powers and functions. (10)
- 10 Explain the role of Zilla Parishad. State its salient features. (10)

Total No. of printed pages = 3

CSE 181302

Roll No. of candidate

180710002019

2021

B.Tech. 3rd Semester End-Term Examination

CSE

OBJECT ORIENTED PROGRAMMING USING C++
(New Regulation w.e.f 2017-18) &
(New Syllabus w.e.f 2018-19)

Full Marks - 70

Time - Three hours

The figures in the margin indicate full marks
for the questions

Answer question No. 1 and any four from the rest.

1. Answer the following : (10 × 1 = 10)

- (i) If class A is a friend of B, then B doesn't become a friend of A automatically.
 - (a) TRUE
 - (b) FALSE
 - (c) Can be true and false
 - (d) Can not say
- (ii) A class is made abstract by declaring at least one of its functions as?
 - (a) abstract classes
 - (b) pure virtual function
 - (c) abstract functions
 - (d) Interface
- (iii) Which stream class is to only write on files
 - (a) of stream
 - (b) ifstream
 - (c) fstream
 - (d) iostream
- (iv) How can we make a class abstract?
 - (a) By declaring it abstract using the static keyword
 - (b) By declaring it abstract using the virtual keyword
 - (c) By making at least one member function as pure virtual function
 - (d) By making all member functions constant

[Turn over

4. (a) Differentiate between object oriented and procedural programming languages. (5)
- (b) Explain the various types of inheritance with diagrams. (5)
- (c) Write about "Model-view-controller pattern". (5)
5. (a) What do you mean by dynamic binding? How is it useful in OOP? (5)
- (b) What is template in C++? Differentiate between class templates and function templates. (5)
- (c) What are the various file opening modes? Explain. (5)
6. (a) What are data types? Write the pre-defined data types in C++. (5)
- (b) Explain the keywords *private*, *public* and *protected*, in context of inheritance. (5)
- (c) What is a Virtual function? Why do we need virtual function? (5)
7. (a) Can you have more than one constructor in a class? If yes, explain the need for such a situation. (5)
- (b) Describe the importance of a destructor. Explain its uses with the help of an example. (5)
- (c) What is a friend function? What are the merits and demerits of using friend function? (5)

Total No. of printed pages = 4

CSE 181304

Roll No. of candidate

1	8	0	7	1	0	0	0	7	0	1	9
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2021

B.Tech. 3rd Semester End-Term Examination
DATA STRUCTURE AND ALGORITHMS
(New Regulation (w.e.f. 2017-18))
(New Syllabus (w.e.f. 2018-19))

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks
for the questions.

Answer question No. 1 and any four from the rest.

1. Answer the following questions : (10 × 1 = 10)
 - (i) Elements in an array are accessed
 - (a) Randomly
 - (b) Sequentially
 - (c) Exponentially
 - (d) Logarithmically
 - (ii) While evaluating a prefix expression, the string is read from?
 - (a) Left to right
 - (b) Right to left
 - (c) Center to right
 - (d) Center to left to right
 - (iii) When an operand is read during Postfix conversion, which of the following is done?
 - (a) It is placed on to the output
 - (b) It is placed in operator stack
 - (c) It is ignored
 - (d) Operator stack is emptied

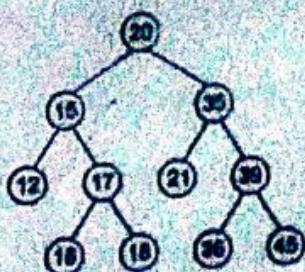
[Turn over

- (iv) What is the time complexity of an infix to postfix conversion algorithm?
- (a) $O(N \log N)$
 - (b) $O(N)$
 - (c) $O(N^2)$
 - (d) $O(M \log N)$
- (v) How many children does a binary tree have?
- (a) 2
 - (b) Any number of children
 - (c) 0 or 1 or 2
 - (d) 0 or 1
- (vi) B-tree of order n is a order- n multiway tree in which each non-root node contains
- (a) At most $(n - 1)/2$ keys
 - (b) Exact $(n - 1)/2$ keys
 - (c) At least $2n$ keys
 - (d) At least $(n - 1)/2$ keys
- (vii) Which of the following is false?
- (a) A B+ -tree grows downwards
 - (b) A B+ -tree is balanced
 - (c) In a B+ -tree, the sibling pointers allow sequential searching
 - (d) B+ -tree is shallower than B-tree
- (viii) Hashing is the problem of finding an appropriate mapping of keys into addresses.
- (a) True
 - (b) False
- (ix) Descending priority queue can be implemented using
- (a) Max heap
 - (b) Min heap
 - (c) Min-max heap
 - (d) Trie
- (x) The postfix form of the expression $(A+B)*(C*D - E) * F / G$ is?
- (a) $AB + CD * E - FG /* *$
 - (b) $AB + CD * E - F * * G /$
 - (c) $AB + CD * E - * F * G /$
 - (d) $AB + CDE * - * F * G /$

- (a) Define the term Data Structure. Explain the categorization of Data Structures in detail with example. (1+3=4)
- (b) Write down the algorithm for infix to postfix conversion. Convert the following expression into equivalent postfix expression: $9 * 6 - (4 / 2 + (10 \% 5 * 2 + (8 \% 3)) / 7) * 4$ (3+5=8)
- (c) Explain Threaded Binary Tree with proper diagram. (3)
3. (a) Explain algorithm complexity. Explain different asymptotic notations. (5)
- (b) Write a program to perform the insert and delete operation in a circular queue. (5)
- (c) Construct a BST from the following: 23, 18, 34, 56, 97, 58, 43, 66, 54, 32, 19, 49, 88, 76, 98 (5)
4. (a) Describe the different methods of Graph representations with suitable examples. (5)
- (b) Explain the algorithm to perform the following operations in a doubly linked list: (10)
 - (i) Insert element at the beginning.
 - (ii) Delete element after a specific element.
5. (a) Explain Binary Searching technique with proper example. Analyse the time complexity for different best, worst and average case. (5)
- (b) Consider the following key values and construct a B Tree of order 3: (10)

7 2 10 8 11 9 22 13 19 20 32 6 40 3

~~BINARY SEARCH~~
6. (a) Traverse the following tree using pre-order, in-order and post-order traversal method: (5)



- (b) Sort the following sequence in descending order using Heap sort: (10)

43 32 10 3 56 78 55 48 28 64 5 38 84 22 15

- (a) Define collision in Hashing. Explain different collision resolution techniques. (5)
- (b) Explain BFS algorithm with proper example. (5)
- (c) Define AVL tree. Construct an AVL tree from the following values (perform rotation if required):
- 50 41 68 32 44 41 (5)

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Total No. of printed pages = 3

CSE 181305

Roll No. of candidate

1 8 0 7 1 0 0 0 9 9 9

2021

B.Tech. 3rd Semester End-Term Examination
Computer Science and Engineering
BASICS OF SIGNALS AND SYSTEMS
(New Regulation w.e.f. 2017-18)
(New Syllabus w.e.f. 2018-19)

Full Marks - 70

Time - Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any four from the rest.

1. Write short answer: (10 × 1 = 10)
 - (i) Define signal.
 - (ii) Write the mathematical expression for unit ramp signal.
 - (iii) Define causal and non-causal signal.
 - (iv) What is the condition for stability of a LTI systems?
 - (v) What is the area of an unit impulse function?
 - (vi) Write down the relation between unit step signal and unit impulse function.
 - (vii) What is meant by Region of Convergence (ROC) in z-transform?
 - (viii) Define static and dynamic system.
 - (ix) At $x = 0$, $\sin c(x) = \text{_____}$.
 - (x) The sum of two periodic signals $x_1(t)$ and $x_2(t)$ with periods T_1 and T_2 is said to be periodic if the ratio of the periods is _____ .

[Turn over]

2. (a) Define periodic signal, non periodic signal, deterministic signal and random signal. (5)

(b) Identify the periodic signals and compute periodicity (fundamental period) if periodic

(i) $x(t) = 2 \cos \frac{2\pi t}{3} + 3 \cos \frac{2\pi t}{7}$

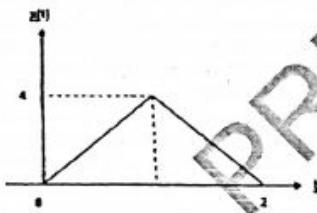
(ii) $x(t) = 3 \cos\left(5t + \frac{\pi}{6}\right)$

(iii) $x[n] = e^{j5m}$. (6)

(c) Find the convolution of the following signal

$x_1(t) = u(t)$ and $x_2(t) = u(t)$. (4)

3. (a) Sketch and label the even and odd component of the signal shown in fig: (6)



(b) Define energy and power signal. (4)

(c) Find the power and energy of the signal $x(t) = e^{at}u(t)$. (5)

4. (a) Explain with example the following operation on a signal: (3)

(i) Time delaying

(ii) Time folding

(iii) Time scaling

(b) Sketch the signals- (4)

(i) $u(-2t + 4)$

(ii) $y[n] = x[2n]$ for $x[n] = \{1, 2, 3, 4, 5\}$.

(c) Determine the following system described by $y(t) = x(t^2)$ is non causal and time variant. (6)

(d) Find the system $y(t) = 4t + x(t)$ is linear or not. (2)

5. (a) Describe the causality and stability properties of LTI system. (8)
(b) Determine the response of the LTI system whose input $x[n]$ and impulse response $h[n]$ are given by $x[n] = \{1, 2, 3, 4\}$ \uparrow $h[n] = \{1, 2, 2, 1\}$. \uparrow (7)
6. (a) Define Laplace transform State the condition for existence of Laplace transform. Find the Laplace transform of the signal $x(t) = e^{-3t}u(t)$ and plot ROC. (8)
(b) The impulse response of an LTI system is $h(t) = 2e^{-3t}u(t)$. Find the response of the system for the input $x(t) = 2e^{-5t}u(t)$ using Fourier Transform. (5)
(c) Define Z-transform. What is meant by region of convergence (ROC) in Z-transform. (2)
7. (a) Find Fourier series coefficient of $x(t) = 4 + 2\cos\frac{2\pi}{3}t + 4\sin\frac{5\pi}{3}t$ and sketch the magnitude and phase spectra. (7)
(b) Establish the relation between Fourier transform and Laplace transform from their basic definition. (3)
(c) State Sampling theorem. Show that the sampling frequency must be at least twice the maximum frequency of the signal for the proper reconstruction of the signal. (5)

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