

Total No. of printed pages = 4

MC 181306

Roll No. of candidate

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2019

B.Tech. 3rd Semester End-Term Examination

CONSTITUTION OF INDIA

(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 questions by choosing the correct option (10 × 1 = 10)
 - (i) The constitution of India came into force on:
 - (a) 26 January 1950
 - (b) 26 January 1949
 - (c) 26 November 1949
 - (ii) Secularism means:
 - (a) Equality of all religion
 - (b) Right to religious freedom
 - (c) All the above

[Turn ove

(iii) Who was the chairman of the drafting committee of the constituent assembly?

- (a) Dr. Rajendra Prasad
- (b) C. Rajagopalachari
- (c) Dr. B.R. Ambedkar

(iv) Fundamental duties of the citizens have been enumerated for the Indian citizens by the:

- (a) 42nd amendment of the constitution
- (b) 52nd amendment of the constitution
- (c) 72nd amendment of the constitution

(v) Which is not a fundamental right?

- (a) Right to religion
- (b) Right to freedom
- (c) Right to property

(vi) Directive principles of state policy are:

- (a) Fundamental rights
- (b) Socio-economic principles
- (c) Enforceable by law

(vii) Who can impeach the president of India?

- (a) Parliament
- (b) Executive
- (c) Judiciary

(viii) Article 352 relates to:

- (a) National emergency
- (b) State emergency
- (c) Financial emergency

(ix) Every big city has a:

- (a) Municipal corporation
- (b) Municipal council
- (c) Municipal board

(x) What is the duration of a Gram Panchayat?

- (a) 6 years
- (b) 5 years
- (c) No fixed tenure

2. (a) Write briefly the history of making of the Indian constitution. (9)

(b) What are the salient features of the constitution of India? (6)

3. (a) Write the main features of the preamble of the constitution of India. (8)

(b) Why is it necessary for a country to have a clear demarcation of powers and responsibilities in the constitution? Explain. (7)

4. (a) Discuss the various fundamental rights embodied in the constitution of India. (7)

(b) What are fundamental duties of the citizens of India? What are the differences between fundamental rights and fundamental duties? (6 + 2 = 8)

5. (a) Write the powers and functions of the parliament of India. (8)

(b) Discuss the constitutional framework and position of the prime minister of India. (7)

6. (a) Write how the president of India is elected? (5)
- (b) "All the powers and functions vested in the president of India are, in practice, exercised by prime minister with the help of the council of ministers". Explain the statement. (10)
7. (a) Discuss the organizational structure of the Panchayati Raj system in India. (6)
- (b) What do you mean by decentralization of power? Discuss briefly how Panchayati Raj system has helped in strengthening decentralisation of power to local bodies. (2+7=9)
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Total No. of printed pages = 6

CSE 181302

Roll No. of candidate

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2019

B.Tech. 3rd Semester End-Term Examination

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 following questions by choosing the correct option :- (10 × 1 = 10)

(i) In C++, when the inheritance is public, the protected methods in base class are _____ in the derived class.

(a) Inaccessible

(b) Private

(c) Protected

(d) Public

[Turn over

(ii) Which among the following is correct in C++?

- (a) Abstract functions should not be defined in all the derived classes
- (b) Abstract functions should be defined only in one derived class
- (c) Abstract functions must be defined in base class
- (d) Abstract functions must be defined in all the derived classes.

(iii) In which access specifier should a constructor be defined, so that object of the class can be created in any function?

- (a) Public
- (b) Protected
- (c) Private
- (d) Any access specifier will work

(iv) If class C inherits class B. And B has inherited class A. Then while creating the object of class C, what will be the sequence of constructors getting called?

- (a) Constructor of C then B, finally of A
- (b) Constructor of A then C, finally of B
- (c) Constructor of C then A, finally B
- (d) Constructor of A then B, finally C

(v) The this pointer is accessible _____

- (a) Within all the member functions of the class
- (b) Only within functions returning void
- (c) Only within non-static functions
- (d) Within the member functions with zero arguments.

(vi) Can a class be declared/defined inside another class in C++?

- (a) Yes
- (b) No

(vii) If a class contains static variable, then every object of the class

- (a) has its own copy of static variable
- (b) shares the same instance of static variable

(viii) If a program uses inline function, then the function is expanded inline at

- (a) Compile time
- (b) Run time

(ix) Which of the following is true?

- (a) Static methods cannot be overloaded
- (b) Static data members can only be accessed by static methods
- (c) Non-static data members can be accessed by static methods
- (d) Static methods can only access static members (data and methods)

(x) Default value of static variable is _____

- (a) 0
- (b) 1
- (c) Garbage value
- (d) Compiler dependent

2. (a) Explain the difference between private and protected member in class with a suitable example. (6)

(b) Write a program using Template Class to define a class stack and implement the method to push, pop and display the element from the stack. (9)

3. (a) List the features of Object Oriented Programming (OOP). State the advantages of OOP approach over procedural Oriented Programming (POP). (8)

(b) Write a C++ program to overload unary operator (++) using friend function. (7)

4. (a) What is an abstract class? How pure virtual function differs from virtual function? (4)
- (b) State the difference between overloading and overriding. (2)
- (c) Create a class complex with constructor overloading to create complex number objects. Write methods in complex class to add two complex number using a friend function and another method to subtract two complex number without using friend function. (9)
5. (a) Explain the advantages of inline function with an example program. (5)
- (b) Explain with diagrams the different types of inheritance. (5)
- (c) How can we use multiple catch functions inside a program? Explain with a suitable C++ program. (5)
6. (a) Explain why exception handling is important in OOP. (4)
- (b) When do we use multi-catch handlers? Explain with an example. (6)
- (c) What are stream classes? Show the hierarchy of the stream classes with a diagram. (5)

7. (a) State the advantages of OOPL? (4)
- (b) Explain briefly about Polymorphism in OOPL.
How it is achieved in C++. (6)
- (c) State the advantages and disadvantages of
Model View Controller. (5)
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Total No. of printed pages = 7

CSE 181305

Roll No. of candidate

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2019

B.Tech. 3rd Semester End-Term Examination

BASICS OF SIGNALS AND SYSTEMS

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

(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. Choose the correct option : (10 × 1 = 10)

(i) Which mathematical notation specifies the condition of periodicity for a continuous time signal?

(a) $x(t) = x(t + T_0)$

(b) $x(n) = x(n + N)$

(c) $x(t) = e^{-\alpha t}$

(d) none of the above

[Turn over]

(ii) Which among the below specified condition / cases of discrete time in terms of real constant 'a', represents the double-sided decaying exponential signal?

- (a) $a > 1$
- (b) $0 < a < 1$
- (c) $a < -1$
- (d) $-1 < a < 0$

(iii) Damped sinusoids are —————

- (a) sinusoid signals multiplied by growing exponentials
- (b) sinusoid signals divided by growing exponentials
- (c) sinusoid signals multiplied by decaying exponentials
- (d) sinusoid signals divided by decaying exponentials

(iv) A system is said to be shift invariant only if —————

- (a) a shift in the input signal, also results in the corresponding shift in the output
- (b) a shift in the input signal does not exhibit the corresponding shift in the output
- (c) a shifting level does not vary in an input as well as output
- (d) a shifting at input does not affect the output

(v) The system $y(t) = x(t) + 2x(t+3)$ is

- (a) causal system
- (b) non-causal system
- (c) partly (a) and partly (b)
- (d) none of these

(vi) Which condition determines the causality of the LTI system in terms of its impulse response?

- (a) Only if the value of an impulse response is zero for all negative values of time
- (b) Only if the value of an impulse response is unity for all negative values of time
- (c) Only if the value of an impulse response is infinity for all negative values of time
- (d) Only if the value of an impulse response is negative for all negative values of time

(vii) Under which conditions does an initially relaxed system become unstable?

- (a) only if bounded input generates unbounded output
- (b) only if bounded input generates bounded output
- (c) only if unbounded input generates unbounded output
- (d) only if unbounded input generates bounded output

(viii) An equalizer used to compensate the distortion in the communication system by faithful recovery of an original signal is nothing but an illustration of _____.

- (a) Static system
- (b) Dynamic system
- (c) Invertible system
- (d) None of the above

(ix) Which block of the discrete time systems requires memory in order to store the previous input?

- (a) Adder
- (b) Signal Multiplier
- (c) Unit Delay
- (d) Unit Advance

(x) The system $\frac{dy(t)}{dt} + t^2 y(t) = 2x(t)$ is

- (a) time invariant system
- (b) time variant system
- (c) partly (a) and partly (b)
- (d) none of these

2. (a) Compare between : $(4 \times 2.5 = 10)$

- (i) Deterministic and stochastic signals
- (ii) Even and odd signals
- (iii) Static and dynamic systems
- (iv) Causal and non-causal systems.

(b) Explain the homogeneity and superposition properties of linear system. (5)

3. (a) Check linearity of the following system: (5)

$$y(t) = t^2 x(t-1)$$

(b) Check stability of the system: $h(t) = te^{at}u(t)$ (5)

(c) Determine whether the system $y(t) = t^2 x(t)$ is time invariant or not. (5)

4. (a) Test whether the given signal is periodic or not:

$$x(t) = \cos t + \sin \sqrt{2}t. \quad (3)$$

(b) Differentiate between energy signal and power signal. (4)

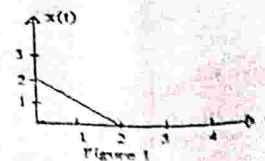
(c) Determine whether the following signals are energy or power signal:

(i) $x(t) = e^{-2t}u(t)$

(ii) $x(t) = tu(t) \quad (4 + 4 = 8)$

5. (a) Prove that the function $x(t) = (t^6 + 2t^4 + 3t^2 + 4)$ is even and also show that its odd part is zero. (3)

(b) Sketch and label the even and odd components of the signal shown in Figure 1: (3)



- (c) The impulse response of the system $h(t) = \begin{cases} u(t), & 0 \leq t \leq 2T \\ 0, & \text{otherwise} \end{cases}$ and the input signal $x(t) = \begin{cases} e^{-at}, & 0 \leq t \leq T \\ 0, & \text{otherwise} \end{cases}$. Find the output of the system $y(t)$. (5)

- (d) Obtain the linear convolution of the following sequences, $x(n) = \{1, -2, 3, -2\}$; $h(n) = \{2, -3, 4\}$:

- (i) Using cross-table method
(ii) Using matrix method. (2+2=4)

6. (a) Explain with examples the following operations on a signal: (6)

- (i) Time delaying
(ii) Time folding
(iii) Time scaling.

- (b) Sketch and label carefully the following signals for the given signal $x(t)$ in Figure 2. (4)

- (i) $x(3t+2)$
(ii) $x\left(\frac{t+6}{3}\right)$

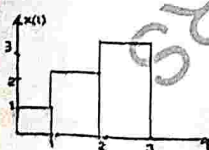


Figure 2

- (c) Find the output response of the system described by the differential equation

$$\frac{d^2 y(t)}{dt^2} + 7 \frac{dy(t)}{dt} + 12 y(t) = \frac{dx(t)}{dt} + x(t)$$

When the input $x(t) = u(t)$, the initial conditions are $y(0^+) = 1$, $\frac{dy(0^+)}{dt} = 1$. (5)

7. (a) Discuss the important properties of the Z-transform. State initial and final value theorem of Z-Transform. (5)

- (b) Write the Dirichlet conditions for periodic signals. Illustrate with proper figure Gibbs phenomenon. (5)

- (c) Determine the sampling frequency of the following signal:

$$x(t) = \sin 2000\pi t + 2 \cos 6000\pi t - 4 \sin 8000\pi t$$

If the sampling rate is 6000 samples per sec, what is the discrete time signal obtained after sampling? (5)

Total No. of printed pages = 8

MA 181301B

Roll No. of candidate

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2019

B.Tech. 3rd Semester End-Term Examination

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

(A) Choose the correct answer :

(i) The mean of n terms is \bar{x} . If the first term is increased by 1, second by 2 and so on, then the new mean is

(a) $\bar{x} + n$

(b) $\bar{x} + \frac{n}{2}$

✓ (c) $\bar{x} + \frac{n+1}{2}$

(d) None of these

$$\frac{(a_1+1) + (a_2+2) + (a_3+3) + \dots + (a_n+n)}{n}$$

$$= \frac{a_1+a_2+\dots+a_n}{n} + \frac{1+2+3+\dots+n}{n}$$

$$= \bar{x} + \frac{n(n+1)}{2n}$$

$$= \bar{x} + \frac{n+1}{2}$$

[Turn over

(ii) In two throws of a dice probability that 6 appears at least once is

(a) $\frac{1}{6}$

(b) $\frac{1}{4}$

(c) $\frac{10}{36}$

✓(d) $\frac{11}{36}$

Not 6 = $\frac{5}{6} \cdot \frac{5}{6} = \frac{25}{36}$

∴ 6 at least once
= $1 - \frac{25}{36} = \frac{11}{36}$

(iii) The mean of a binomial distribution is 10 and its standard deviation is 2. The value of p is

(a) 0.4

(b) 0.6

(c) 1

✓(d) 0.8

$np = 10 \Rightarrow \frac{1}{q} = \frac{10}{2} = 5$
 $npq = 2 \Rightarrow \frac{1}{5} = \frac{1}{5} = 0.2$

∴ $p = 1 - 0.2 = 0.8$

(iv) If A and B are any two events, then P (neither A nor B) equals

✓(a) $1 - P(A \cup B)$

(b) $P(\bar{A}) + P(\bar{B})$

(c) $1 - P(A \cap B)$

(d) $1 - P(A) - P(B)$

$P(A' \cap B') = 1 - P(A \cup B)$

If the correlation co-efficient between x and y is 0.28, covariance between x and y is 7.6 and the variance of x is 9, then the standard deviation of y is approximately

(a) 9.8

(b) 10.1

(c) 9.05

(d) 10.05

(vi) If the angle between the two lines of regression is 90° , then it represents

(a) perfect correlation

(b) perfect negative correlation

(c) no linear correlation

(d) none of these

(vii) If $P(x=2) = 9P(x=4) + 90P(x=6)$, then the standard deviation of the Poisson variate x is

(a) 1

(b) $\sqrt{2}$

(c) 2

(d) 4

(viii) Which vectors is a probability vector?

(a) $\left(\frac{1}{2}, \frac{1}{3}, 0, \frac{1}{5}\right)$

(b) $(3, 4, 1, -7)$

(c) $\left(\frac{1}{4}, \frac{1}{3}, \frac{3}{4}, -\frac{1}{3}\right)$

(d) $\left(\frac{1}{4}, \frac{1}{4}, 0, \frac{1}{2}\right)$

(B) Fill in the blanks :

(ix) If d_i denotes the rank difference of the i^{th} individual, then the rank correlation co-efficient between two characteristics of a group of n individuals is given by _____.

(x) The value that separates the acceptance region from the rejection region is called the _____.

2. (a) What is the probability that a leap year selected at random will contain either 53 Thursdays or 53 Fridays or both?

(b) The probabilities that three persons A, B, C becoming managers are $\frac{4}{9}$, $\frac{2}{9}$ and $\frac{1}{3}$ respectively. The probabilities that the bonus scheme will be introduced if they become managers are $\frac{3}{10}$, $\frac{1}{2}$ and $\frac{4}{5}$ respectively.

(i) What is the probability that the bonus scheme will be introduced?

(ii) If the bonus scheme has been introduced what is the probability that it was due to Mr. A being appointed as Manager? ($2+3=5$)

(c) Find the arithmetic mean, median and mode for the following distribution

Class interval: 0-10 10-20 20-30 30-40 40-50

Frequency: 5 8 15 16 6

Which one of the three averages do you consider to be more representative and why?

3. (a) Fit a least square straight line to the following data:

x: 2 7 9 1 5
y: 13 21 23 14 15

Hence predict $y(4)$. (4)

(b) Two dice are tossed simultaneously. Write the probability distribution for the difference of the numbers shown on the two faces. Also find its mean and variance. (4)

(c) A variable x has binomial distribution with $n=100$ and $p=0.01$. Using suitable distribution find:

(i) $P(x=0)$

(ii) $P(x>2)$ and

(iii) $E(x)$.

(d) Find the unit fixed probability vector of the matrix (4)

$$A = \begin{pmatrix} 0 & 1 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \end{pmatrix}$$

4. (a) The appearing of 1 or 2 on a die is counted as a success. Four dice are thrown 243 times. Find the expected number of times of getting

(i) at least two successes

(ii) exactly three successes. (4)

(b) Calculate the correlation co-efficient and hence obtain the equations of the two regression lines from the following data: (5)

x: 1 2 3 4 5
y: 2 5 3 8 7

(c) A fair coin is tossed twice. Let x denotes 0 or 1 according as a head or a tail appears on the first toss. Let y denotes the number of heads which occur.

(i) Find the marginal distributions of x and y

(ii) Write the joint distribution of x and y

(iii) Find $E(x)$ and $E(y)$. ($2+2+2=6$)

5. (a) A continuous random variable x has the following probability density function :

$$f(x) = \begin{cases} k(1-x^2) & \text{for } 0 < x < 1 \\ 0 & \text{elsewhere} \end{cases}$$

Find

- (i) k
- (ii) $P(x > 0.5)$. (1+2=3)
- (b) The regression lines between two variables x and y are given as $2x + 3y - 6 = 0$ and $5x + 7y - 12 = 0$. Obtain
 - (i) the mean of x and the mean of y
 - (ii) correlation co-efficient between x and y
 - (iii) σ_x if σ_y is given to be 3. (2+2+1=5)
- (c) In a sample analysis of 600 students it was found that 280 students have failed, 170 secured a 3rd class, 90 secured a second class and the rest a first class.

Do these figures support the general belief that above categories are in the ratio 4:3:2:1? (4)

- (d) Test whether the given matrix is regular stochastic or not (3)

$$B = \begin{pmatrix} \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 \\ \frac{1}{4} & \frac{1}{4} & \frac{1}{2} \end{pmatrix}$$

6. (a) The mean height of 500 students in a certain college is 151 cm and the standard deviation is 15 cm. Assuming the heights to be normally distributed find how many students have heights

(i) between 120 cm and 145 cm

(ii) below 165 cm. (3+2=5)

- (b) Write the conditions under which t -test is applicable. Also write one application of it. (2)

- (c) It is known from the past experience that the mean weight of the products from a filling machine is 10 gms. A random sample of 10 shows that weight (in grams) of the sample products are as follows :

9.8, 10.3, 10.4, 9.6, 9.5, 9.7, 9.8, 10.4, 10.2, 10.3

Test the significance of the difference of the sample mean from the population mean. (5)

- (d) The screws produced in machine A has mean length 5.2 cm with s.d. 0.4 cm while that produced by machine B has mean length 6.4 cm with s.d. 0.6 cm. Which of these is more variable? (3)

7. (a) The following values were obtained from a frequency distribution :

$$\sum f = 100, \sum fx = -100, \sum fx^2 = 5500,$$

$$\sum fx^3 = -6250 \text{ and } \sum fx^4 = 775000.$$

Find the moments about mean and hence find the moment co-efficients of skewness and kurtosis. Also discuss the nature of skewness and kurtosis. (3+2+2=7)

(b) Define :

- (i) Markov process
- (ii) Markov chain and
- (iii) Stochastic matrix.

(3)

(c) Draw the transition diagram for the following transition matrix :

(3)

$$A = \begin{matrix} & \begin{matrix} a_1 & a_2 & a_3 \end{matrix} \\ \begin{matrix} a_1 \\ a_2 \\ a_3 \end{matrix} & \begin{pmatrix} 0 & 1 & 0 \\ \frac{1}{3} & 0 & \frac{2}{3} \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{4} \end{pmatrix} \end{matrix}$$

(d) Show that correlation coefficient is the geometric mean of the two regression co-efficients.

(2)

Total No. of printed pages = 3

CSE 181304

Roll No. of candidate

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2019

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 : (MCQ/Fill in the blanks)
(10 × 1 = 10)

- (a) What do you mean by efficiency of an algorithm?
- (b) What are the different ways of representing a graph?
- (c) What is hashing?
- (d) What is a self-referential structure?
- (e) What are asymptotic notations?

[Turn over

- (f) What is in-place sorting?
- (g) What is balancing factor of an AVL tree?
- (h) What is a threaded binary tree?
- (i) Give an example of stable sort.
- (j) What is an abstract data type?

2. (a) Write the pre-order expression for the following using a stack. (5)
 $[a + (b - c)] * [(d - e) / (f + g - h)]$
- (b) Sort (increasing order showing all the steps) the following using merge sort and quick sort. (5+5=10)

8, 2, 4, 6, 9, 7, 10, 1, 5, 3

3. (a) What are the advantages and disadvantages of array representation of stack and queue over linked list representation? (5)
- (b) Suppose you are given two polynomials. Represent the polynomial in a suitable data structure and write a program to add 2 polynomials. (10)

4. (a) Using the following traversals, construct the corresponding binary tree (show all steps). (5)

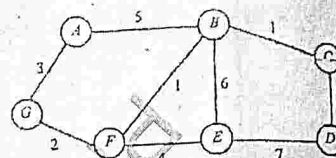
In order: H K D B I L E A F C M J G

Pre-order: A B D H K E L C F G J M

- (b) What is the difference between a BST and a heap? For the given sequence of numbers, construct a heap and a BST. (4 + 3 = 7)

34, 23, 67, 45, 12, 54, 87, 43, 98, 75, 84, 93, 31

5. (a) Use Prim's/ Kruskal algorithm to find the minimum spanning tree of the graph. (5)



- (b) How do you resolve hash clashes by open addressing method. Explain. (10)
6. (a) Write a program to implement a circular queue using an array. (5)
- (b) Insert the following keys in a B-tree of order 5 and show the steps in constructing the final tree:
 10, 24, 23, 11, 31, 16, 26, 35, 29, 20, 46, 28, 13, 27, 31 (10)
7. (a) Write a menu based program to implement a stack using an array. (5)
- (b) Show the results of inserting the following elements: 2, 1, 4, 5, 9, 3, 6, 7 in an AVL tree. Specify the type of rotation after each insertion. (10)

Total No. of printed pages = 4

CSE 181303

Roll No. of candidate

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2019

B.Tech. 3rd Semester End-Term Examination

DIGITAL SYSTEMS

New Regulation (w.e.f 2017 – 2018) &
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 any *ten* of the following questions :

(10 × 1 = 10)

- (a) Convert binary 1001 to Gray code.
- (b) ASCII code is a _____ bit code.
- (c) What do you mean by active-LOW input gate?
- (d) The interconnection of gates to perform a variety of logical operations is called _____

(e) De Morgans theorem states that (Choose the right alternative)

- (i) $\overline{A+B} = \overline{A}.\overline{B}$ and $\overline{AB} = \overline{A} + \overline{B}$
- (ii) $\overline{A+B} = \overline{A} + \overline{B}$ and $\overline{AB} = \overline{A}.\overline{B}$
- (iii) $\overline{A+B} = A+B$ and $\overline{AB} = A.B$
- (iv) $\overline{A+B} = \overline{A}.\overline{B}$ and $\overline{AB} = \overline{A}.\overline{B}$

[Turn over

(f) The simplified form of Boolean expression $(X+Y+XY)(X+Z)$ is (Choose the right alternative)

- (i) $X + Y + Z$
- (ii) $XY + YZ$
- (iii) $X + YZ$
- (iv) $XZ + Y$

(g) The number of cells in a 6 variable K map is (Choose the right alternative)

- (i) 6
- (ii) 12
- (iii) 36
- (iv) 64

(h) Compare a decoder with a demultiplexer.

(i) A combinational logic circuit which is used to send data coming from a single source to two or more separate destination is called (Choose the right alternative)

- (i) a decoder
- (ii) an encoder
- (iii) a multiplexer
- (iv) a demultiplexer

(j) The transparent latch is (Choose the right alternative)

- (i) an SR flip flop
- (ii) a D flip flop
- (iii) a T flip flop
- (iv) a JK flip flop

(k) How many states a 6 bit ripple counter can have? (Choose the right alternative)

- (i) 6
- (ii) 12
- (iii) 32
- (iv) 64

(l) Convert 2598.675_{10} to hex.

2. (a) State and prove De Morgan's theorems, Reduce the expression: (3+3=6)

$$f = [B + \overline{C} \cdot (\overline{AB} + \overline{AC})]$$

(b) (i) Expand $\overline{A} + \overline{B}$ to minterms and maxterms.

(ii) Minimize the following expression using K Map

$$F(A, B, C, D) = \sum m(1, 4, 7, 10, 13) + \sum d(5, 14, 15)$$

(iii) Prove that: $AB + \overline{AC} + \overline{ABC}(AB + C) = 1$.

3. (a) What is combinational circuit? Design a full adder using half adders. What is a ripple carry adder? (2+3+1=6)

(b) Implement the following logic function using 8×1 MUX: (5)

$$F(A, B, C, D) = \sum m(1, 3, 4, 11, 12, 13, 14, 15)$$

(c) (i) Design a full adder using a decoder. (4)

Or

(ii) Design a 2-bit magnitude comparator. (4)

4. (a) What are sequential circuits? Differentiate between synchronous sequential circuits and asynchronous sequential circuits. (2+3=5)

(b) (i) Draw the circuit diagram of a positive edge triggered JK flip flop and explain its operation with the help of a truth table. How is race around condition eliminated? (6+2)

Or

(ii) Convert an SR flip flop to JK flip flop. (8)

(c) Discuss the applications of flip flops. (2)

5. (a) With the help of a neat diagram, explain the working of a R-2R ladder network type DAC. A 6-bit DAC has a step size of 50 mV. Determine the full scale output voltage and percentage resolution. (5+3=8)

(b) Design a Mod-6 Asynchronous Counter using T flip flop. (7)

6. Write short notes on: (any three) (3 × 5 = 15)

(a) Synchronous counters. ✓

(b) Parallel-in, Serial-out shift registers. ✓

(c) Programmable Array Logic (PAL).

(d) Ring Counters. ✓

(e) Priority Encoders.

(f) Latches