

- N. B.: (1) **All** questions are **compulsory**.
(2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.
(3) Answers to the **same question** must be **written together**.
(4) Numbers to the **right** indicate **marks**.
(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt **any three** of the following:

- What is analog signal? Explain frequency, amplitude with respect to analog signal.
- Encode the following decimal number in binary number system.
i) 25.45 ii) 134
- Express the 10101100 BCD code into Grey code and also in Excess-3 code.
- i) Perform the subtraction using 1's complement method.
11011 - 10100
ii) Perform the addition of given binary numbers.
1000011 + 1110001
- Write a short note on HOLLERITH code.
- i) Convert 45 from octal number into decimal.
ii) Convert 9A from hexadecimal number into decimal.
iii) Convert 46.23 from decimal to binary.

2. Attempt **any three** of the following:

- For the logic expression $Y = AB' + A'B$. Obtain the truth table, name the gate and operation performed and symbol for it also realize this using AND, OR, NOT gates. 15
- Prove the given Boolean expression using Boolean laws and draw the circuit for it using NAND gate only.
 $A.B + A'B + A'B' = A' + B$
- State and prove De-Morgan's theorem and realize it using basic gates.
- Realize the given Boolean expression using NOR gate only.
 $Y = (A'+B+C) \cdot (A+B'+C') \cdot (A'+B+C') \cdot (A'+B+C)$
- Using Karnugh's map simplify the following SOP function and implement it with basic gates. $F(A,B,C,D) = (2,3,6,7,8,10,11,12) + d(14,15)$
- Obtain product of sum expression for the following function and implement it using NOR gates. $F(P,Q,R,S) = (0,3,4,5,6,7,12,13)$

3. Attempt **any three** of the following:

- What is full adder? Draw logic circuit diagram and explain it. 15
- Design BCD to Excess -3 code converter.
- With the help of IC 7483 block diagram explain BCD adder.
- Describe Half subtractor with help of circuit diagram and truth table.
- What is comparator circuit? Discuss detail working of it.
- Design and implement Binary to Gray code converter circuit.

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4. Attempt any three of the following:

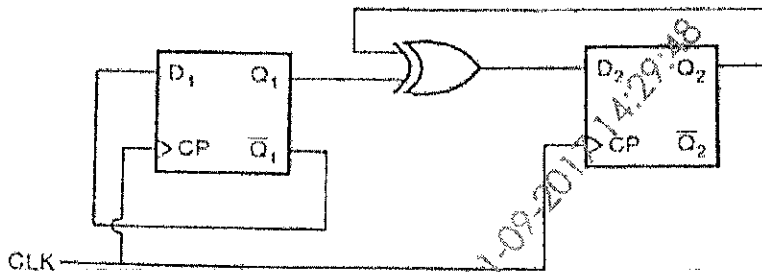
15

- a Draw logic circuit diagram of D flip flop and explain its working.
- b Discuss clocked S-R flip flop using four NAND gates.
- c How JK flip flop is derived from S-R flip flop? Explain.
- d Write a short note on Multiplexer.
- e With the help of two 4:1 multiplexer how can we build 8:1 multiplexer? Explain.
- f Explain the role of ALU as a part of computer system.

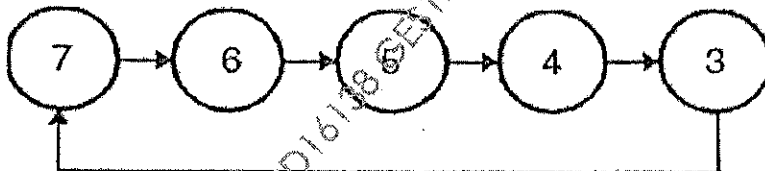
5. Attempt any three of the following:

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- a Explain the operation of SIPO shift register.
- b Design a synchronous decade counter using D flip flops.
- c Explain the working of Johnson counter.
- d Draw a schematic diagram of 4-bit bi-directional shift register using R-S flip flops and explain its working.
- e For the logic circuit shown, draw the timing diagram of CP, Q₂ and Q₁, assuming the initial conditions Q₂ = Q₁ = 0.



f. Design a ripple counter for the states shown below:



FY (IT) Sem - I
Sept - 2016
Communication Skills
(2½ Hours)

Q.P. Code : 750500

[Total Marks: 75

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(5) Draw neat labeled diagrams wherever necessary.
(6) Use of Non-programmable calculators is allowed.

1. **Attempt any three of the following:** 15
a. List the seven C's needed for effective communication. Elaborate with examples any three C's.
b. Discuss any three barriers that lead to communication breakdown in an organisation.
c. Explain the various stages incorporated for developing relationships through interpersonal communication.
d. 'Gestures are observed actions' - Elaborate.
e. Discuss about different communication styles highlighting low and high context cultures.
f. Elaborate on the merits of using technology in business communication.
2. **Attempt any three of the following:** 15
a. Why is 'revising' considered as an essential step to preparing business messages?
b. State the factors used for audience analysis.
c. Which format (chronological/functional/combinaton) of résumé is suitable for a fresh graduate and why?
d. Explain any five variables that create barriers for effective listening.
e. Distinguish between (i) clues and cues (ii) signs and signals
f. Imagine yourself as a manager of a multi-national company, about to interview a candidate. Apply the fundamental principles of Interviewing and frame five questions based on the principles, write the principle used and purpose of asking the question.
3. **Attempt any three of the following:** 15
a. State the disadvantages of teleconferences.
b. How is group discussion a better technique than interviews, for selecting a marketing post applicant?
c. Develop a template for a briefing on Rio Olympics.
d. How marketing communication works?
e. Discuss briefly the preparatory steps involved in a team presentation.
f. Explain the importance of minutes for a post-meeting review.
4. **Attempt any three of the following:** 15
a. What are the various aspects of corporate communication?
b. What is the difference between a basic and interactive communication model?
c. Discuss the two types of organizational conflicts with suitable examples.
d. Effective communication and ethical communication is the same thing -Justify.
e. Explain the ethical issues involved in business communication.
Elaborate on effective usage of semicolon and colon in using the elements of standard English.

TURN OVER

5. Attempt any three of the following:
- What are the steps for executing the presentations?
 - Create a mind map of Network connectivity.
 - Explain the importance of impress stage.
 - How to create an outline for the presentation?
 - How is concept map different from mind map?
 - 'Practicing the presentation process is a must'-Elucidate.

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FY (IT) Sem-I
Nov-2016
Imperative programme
(2½ Hours)

Q. P. CODE : 750101

[Total Marks: 75

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1. Attempt any three of the following: 15

- What is the difference between machine level language and high level language?
- Describe the structure of a C Program.
- List and explain five desirable program characteristics.
- Explain the following with example
 - Symbolic Constants
 - Escape Sequences
- Draw a flowchart to find the largest of three numbers.
- Determine if the following constants are valid in C
 - 27,822
 - 0.8E 8
 - "Name:
 - "1.3e-12"
 - 0xBCFDAL

2. Attempt any three of the following: 15

- Write a program in C to find the Roots of a Quadratic Equation.
- Explain the conditional operator and assignment operators in C with example.
- Interpret the following C statements
 - `scanf("%8d %*d %12f %12i", &a, &b, &c, &d);` [2]
 - `scanf("%c %c %c", &a, &b, &c);` [1]
 - `scanf("%d %d %f %f", &a, &b, &c, &d);` [2]
- Write a program in C to solve the following expression $F = P(1+i)^n$
- What is a relational expression? List all operators used with it.
- Explain gets and printf statements used in C programming language.

3. Attempt any three of the following: 15

- Write the syntax of the if-else statement in C. What are nested 'if' statements?
- Write a program in C to find the sum of the series $Y = 1^2 + 2^2 + 3^2 + 4^2 + 5^2 + \dots + n^2$ using a while loop.
- What is the difference between while and do-while statements in C.
- Write a function in C to swap two integer variable using call by value and call by reference.
- Explain the switch case statement in C with an example.
- Explain the following with respect to function in C
 - function prototype
 - formal arguments
 - return expression

[TURN OVER]

4. Attempt any three of the following:

15

- a Explain the meaning of following keywords in C.
- auto
 - register
 - static
- b Write the use of #define directive. Also give suitable examples.
- c What is a macro? Write a program in C to find the area of a rectangle and square using macros.
- d What is an array? How can a single dimensional array be initialized?
- e Write a program in C to check whether a number is stored in an array of ten integers. If present display its position else display appropriate error message.
- f Explain strlen, strcat, strcmp functions with example.

5. Attempt any three of the following:

15

- a Explain
- Pointer declaration
 - '*' and '&' operators used with pointers
- b Can structure variable be passed to function as an argument? Justify.
- c Write a program in C to display the cube of ten elements of an integer array using pointers
- d Explain the statements of the main() function with its output
- ```
#include<stdio.h>
void main()
{ int line[80];
 int *p1;
 line[2] = line[1];
 line[2] = *(line+1);
 *(line+3)= line[1] +3 ;
 *(line+2)= *(line+1);
 p1 = & line[1];
 p1 = line +1;
}
```
- e Explain nested structure in C with example.
- f How array can be used in structure? Explain array of structure variables.

FY (IT)  
NOV-2016

(2½ Hours)

Operating System

Q.P. Code : 750301

[Total Marks: 75]

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(5) Draw neat labelled diagrams wherever necessary.  
(6) Use of Non-programmable calculators is allowed.

1. Attempt any three of the following:
- Explain third generation operating systems.
  - List and explain system calls for process management.
  - Explain client-server model
  - Explain the dining philosopher's problem.
  - Explain round robin scheduling. give proper example.
  - Write a short note on semaphores.
2. Attempt any three of the following: 15
- Explain with example the second chance page replacement algorithm.
  - Explain swapping.
  - Write a short note on segmentation.
  - List and explain different file attributes.
  - List various ways of implementing files. Explain any one in detail.
  - Explain disk quotas.
3. Attempt any three of the following: 15
- Write a short note on direct memory access.
  - Explain programmed I/O.
  - List different I/O software layers. Explain any two of them.
  - What is deadlock? List and explain conditions that are necessary for a resource deadlock to occur.
  - Explain deadlock detection algorithm to detect deadlock when multiple resources of each type are available.
  - How are deadlocks prevented? Explain.
4. Attempt any three of the following: 15
- Write the advantages of virtualization.
  - With neat diagram explain type 1 and type 2 hypervisor.
  - What is cloud? Write the essential characteristics of cloud.
  - List different types of multiprocessor operating systems. Explain any two.
  - With neat diagram explain various interconnection technologies used in multicomputer.
  - Write a short note on remote procedure call.
5. Attempt any three of the following: 15
- Explain the kernel structure of Linux.
  - Explain Android architecture.
  - List and explain file-system system calls in Linux.
  - Write down I/O and object manager steps for creating/opening a file and getting back a file handle.  
List Win32 calls for managing processes, threads and fibres.
  - List and explain attributes used in MFT records.

FY (II) Sem - I  
Nov - 2016.

Q.P. Code : 750401

(2½ Hours)

Discrete Mathematics

[Total Marks: 75]

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(5) Draw **neat labeled diagrams** wherever **necessary**.  
(6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt **any three** of the following:

- a. Define the following:  
i. Universal statement  
ii. Existential universal statement  
iii. Subset  
iv. Cartesian product  
v. Relation
- b. i. Which of the following sets are equal? Justify your answer.  
 $A = \{0, 1, 2\}$   
 $B = \{x \in \mathbf{R} \mid -1 \leq x \leq 3\}$   
 $C = \{x \in \mathbf{R} \mid -1 < x < 3\}$   
 $D = \{x \in \mathbf{Z} \mid -1 < x < 3\}$   
 $E = \{x \in \mathbf{Z}^+ \mid -1 < x < 3\}$   
ii. For each integer  $n$ ,  $T_n = \{n, n^2\}$ . How many elements are there in each of  $T_2, T_{-3}, T_1, T_0$ . Justify your answers.
- c. For each positive integer  $i$ ,  $A_i = \left\{x \in \mathbf{R} \mid -\frac{1}{i} < x < \frac{1}{i}\right\} = A_i = \left(-\frac{1}{i}, \frac{1}{i}\right)$   
i. Find  $A_1 \cup A_2 \cup A_3$  and  $A_1 \cap A_2 \cap A_3$   
ii. Find:  
$$\bigcup_{i=1}^{\infty} A_i \text{ and } \bigcap_{i=1}^{\infty} A_i$$
- d. Explain Russell's Paradox with an example.
- e. Write the following statements using the symbols  $\sim, \wedge, \vee$  and the indicated letters to represent the component statements.  $h$ : "Raj is healthy",  $w$ : "Raj is wealthy",  $s$ : "Raj is wise"  
i. Raj is healthy and wealthy but not wise.  
ii. Raj is not wealthy but he is healthy and wise.  
iii. Raj is neither healthy, wealthy nor wise.  
iv. Raj is neither wealthy, nor wise but he is healthy.  
v. Raj is wealthy but he is not both healthy and wise.
- f. In the back of an old cupboard there is a note signed by a pirate famous for his bizarre sense of humor and love of logical puzzles. In the note he wrote that he had hidden treasure somewhere on the property. He listed five true statements listed below and challenged the reader to use them to figure out the location of the treasure. Write the sequence of steps and locate the treasure.  
i. If this house is next to a lake, then the treasure is not in the kitchen.  
ii. If the tree in the front yard is an elm, then the treasure is in the kitchen.  
iii. This house is next to a lake.  
iv. The tree in the front yard is an elm or the treasure is buried under the flagpole.  
v. If the tree in the back yard is an oak, then the treasure is in the garage.  
Where is the treasure?

TURN OVER



2. Attempt any three of the following:

15

- a. Define a predicate and its truth set. Let  $P(x)$  be a predicate " $x^2 > x$ " with domain the set  $\mathbf{R}$  of all real numbers. Write  $P(2)$ ,  $P(\frac{1}{2})$  and  $P(-\frac{1}{2})$  and indicate, which of these statements are true and which are false.
- b.
  - i. Using the laws for negating universal and existential statements, derive the following rules:  
 $\sim(\forall x \in D(\forall y \in E(P(x, y)))) \equiv \exists x \in D(\exists y \in E(\sim P(x, y)))$  and  
 $\sim(\exists x \in D(\exists y \in E(P(x, y)))) \equiv \forall x \in D(\forall y \in E(\sim P(x, y)))$
  - ii. Indicate which of the following statements are true and which are false. Justify your answers.
    - $\forall x \in \mathbf{Z}^+, \exists y \in \mathbf{Z}^+$  such that  $x = y + 1$ .
    - $\forall x \in \mathbf{Z}^+$  and  $\forall y \in \mathbf{Z}^+, \exists z \in \mathbf{Z}^+$  such that  $z = x - y$ .
- c. Indicate whether the following arguments are valid or invalid. Support your answer with diagrams:
  - i. All human beings are mortal.  
Raju is mortal.  
 $\therefore$  Raju is human being.
  - ii. All polynomial functions are differentiable.  
All differentiable functions are continuous.  
 $\therefore$  All polynomial functions are continuous.
- d. Define prime numbers and composite numbers. Express the definition using symbols. Prove that every integer greater than 1 is either prime or composite. Write first six prime numbers and composite numbers.
- e.
  - i. State the quotient remainder theorem.
  - ii. Today is Friday (11/11/2016). 2017 is not a leap year. Find the day of week, 1 year from today.
  - iii. Suppose  $m$  is an integer. If  $m \bmod 11 = 6$ , what is  $4m \bmod 11$ ?
- f. State the Euclidian algorithm. Find the gcd of (330, 156) by using Euclidean algorithm,

3. Attempt any three of the following:

15

- a. Using the method of induction prove that:  
 $(1 - \frac{1}{2^2}) \cdot (1 - \frac{1}{3^2}) \dots (1 - \frac{1}{n^2}) = \frac{n+1}{2n}$  for all integers  $n \geq 2$ .
- b. Prove that if the given predicate is true before entering the loop, it is true after exiting the loop.  
 loop: while ( $n \geq 3$  and  $n \leq 100$ )  
 $n := n + 1$   
 end while  
 predicate:  $2n + 1 \leq 2^n$
- c. Suppose a sequence  $b_0, b_1, b_2, \dots$  satisfies the recurrence relation  
 $b_k = 4b_{k-1} + 4b_{k-2}$  for all integers  $k \geq 2$  with initial conditions  $b_0 = 1$  and  $b_1 = 3$ . Find the explicit formula for  $b_0, b_1, b_2, \dots$
- d. Define (i) Function (ii) Logarithm (iii) Logarithmic function (iv) Boolean function (v) Image and Inverse Image.

TURN OVER

- e. Define surjective function and inverse function. Find the inverse of the following functions:
- Define  $f: \mathbf{Z} \rightarrow \mathbf{Z}$  by the rule  $f(n) = 2n$  for all integers  $n$ .
  - Define  $G: \mathbf{R} \rightarrow \mathbf{R}$  by the rule  $G(x) = 4x - 5$  for all real numbers  $x$ .
- f. Let  $f: \mathbf{Z} \rightarrow \mathbf{Z}$  be the successor function and let  $g: \mathbf{Z} \rightarrow \mathbf{Z}$  be the squaring function. Then  $f(n) = n + 1$  for all  $n \in \mathbf{Z}$  and  $g(n) = n^2$  for all  $n \in \mathbf{Z}$ .
- Find the compositions  $g \circ f$  and  $f \circ g$ .
  - Is  $g \circ f = f \circ g$ ? Explain.

4. Attempt any three of the following:

15

- a. A Relation  $R$  from  $\mathbf{R}$  to  $\mathbf{R}$  is defined as follows: For all  $(x, y) \in \mathbf{R} \times \mathbf{R}$ ,

$$x R y \Leftrightarrow y = 2|x|.$$

Draw the graphs of  $R$  and  $R^{-1}$  in the Cartesian plane. Is  $R^{-1}$  a function?

- b. The congruence modulo 3 relation  $T$  on  $\mathbf{Z}$  is defined as follows: For all integers  $m$  and  $n$ ,

$$m T n \Leftrightarrow 3 \mid (m - n).$$

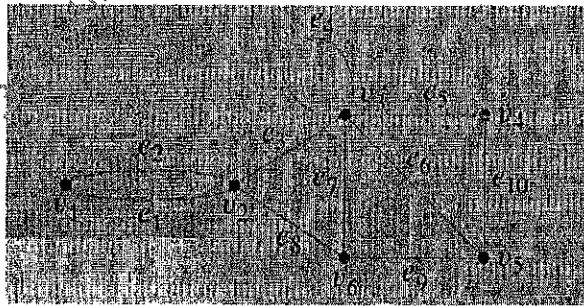
i. Is  $T$  reflexive? ii. Is  $T$  symmetric? iii. Is  $T$  transitive?

- c. A relation  $R$  on  $A$  is defined as follows:

$$\text{For all } (a, b), (c, d) \in A, (a, b) R (c, d) \Leftrightarrow ad = bc.$$

- Prove that  $R$  is transitive.
  - Describe the distinct equivalence classes of  $R$ .
- d. Define graph, digraph, simple graph and subgraph. Draw a graph with the specified properties or show that no such graph exists.
- A graph with four vertices of degrees 1, 2, and 3
  - A graph with four vertices of degrees 1, 3, and 3
  - A simple graph with four vertices of degrees 1, 1, 3, and 3
- e. In the graph below, determine which of the following walks are trails, paths, circuits, or simple circuits. Justify your answer.

- $v_1 e_1 v_2 e_3 v_3 e_4 v_3 e_5 v_4$
- $e_1 e_3 e_5 e_5 e_6$
- $v_2 v_3 v_4 v_5 v_3 v_6 v_2$
- $v_2 v_3 v_4 v_5 v_6 v_2$
- $v_1 e_1 v_2 e_1 v_1$  f.  $v_1$



- f. Explain rooted tree and binary trees. Draw binary trees to represent the following expressions:
- $((a - b) \cdot c) + (d/e)$
  - $a \cdot b - (c / (d + e))$

TURN OVER

5. Attempt *any three* of the following:

- a. One urn contains one blue ball (labeled  $B1$ ) and three red balls (labeled  $R1$ ,  $R2$ , and  $R3$ ). A second urn contains two red balls ( $R4$  and  $R5$ ) and two blue balls ( $B2$  and  $B3$ ). An experiment is performed in which one of the two urns is chosen at random and then two balls are randomly chosen from it, one after the other without replacement.
- Construct the possibility tree showing all possible outcomes of this experiment.
  - What is the total number of outcomes of this experiment?
  - What is the probability that two red balls are chosen?
- b.
- In a group of six people, must there be at least two who were born in the same month? In a group of thirteen people, must there be at least two who were born in the same month? Why?
  - A drawer contains ten black and ten white socks. You reach in and pull some out without looking at them. What is the least number of socks you must pull out to be sure to get a matched pair? Explain how the answer follows from the pigeonhole principle.
- c. If  $n$  is a positive integer, how many 4-tuples of integers from 1 through  $n$  can be formed in which the elements of the 4-tuple are written in increasing order but are not necessarily distinct?
- d. Use Pascal's formula to prove by mathematical induction that if  $n$  is an integer and  $n \geq 1$ , then

$$\sum_{i=2}^n \binom{i}{2} = \binom{2}{2} + \binom{3}{2} + \dots + \binom{n+1}{2} = \binom{n+2}{3}$$

- e. Suppose a person offers to play a game with you. In this game, when you draw a card from a standard 52-card deck, if the card is a face card you win Rs. 3, and if the card is anything else you lose Re. 1. If you agree to play the game, what is your expected gain or loss?
- f. Consider a medical test that screens for a disease found in 5 people in 1,000. Suppose that the false positive rate is 3% and the false negative rate is 1%. Then 99% of the time a person who has the condition tests positive for it, and 97% of the time a person who does not have the condition tests negative for it.
- What is the probability that a randomly chosen person who tests positive for the disease actually has the disease?
  - What is the probability that a randomly chosen person who tests negative for the disease does not indeed have the disease?