

F.Y.B.Sc (Comp. Sci) Sem - I Comp. Orgn & Design

2017

Q.P. Code : 754600

(2½ Hours)

Total Marks 75

- NOTE:**
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Illustrations, in-depth answers and diagrams will be appreciated.
 - 4) Mixing of sub-questions is not allowed.

1. 1) Attempt All Questions. 15

a) Multiple Choice Questions.

- i) The decoded instruction is stored in ____.
a) IR b) PC c) Registers d) MDR
 - ii) ____ is used to store data in registers.
a) D Flip-flop b) JK Flip-flop
c) RS Flip-flop d) None of these
 - iii) ANSI stands for ____.
a) American National Standards Institute
b) American National Standard Interface
c) American Network Standard Interfacing
d) American Network Security Interrupt
 - iv) The instruction, Add #45, R1 does ____.
a) Adds the value of 45 to the address of R1 and stores 45 in that address.
b) Adds 45 to the value of R1 and stores it in R1.
c) Finds the memory location 45 and adds that content that of R1.
d) None of these.
 - v) The addressing mode which uses the PC instead of a general purpose register is ____.
a) Indexed with offset b) Relative
c) direct d) Both a) and c)
- b) Fill in the blanks (Attempt all)**
- i) Flip-flop is a basic element of ____ circuits.
 - ii) The Minimum number of selection inputs required for selecting one out of 32 inputs are ____.
 - iii) Race condition may exist in ____ sequential circuits.
 - iv) When 1101 is used to divide 100010010 the remainder is ____.
 - v) The usual BUS structure used to connect the I/o devices is ____.

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- c) Short Answers (Attempt all)**
- What are shift registers?
 - Design NOR gate using AND, OR, NOT gates.
 - Define SOP and POS terms.
 - How instructions of typical microprocessors are classified?
 - What are uses of interrupts?
- 2. Attempt the following (Any Three):**
- With the help of neat diagram explain basic functional units of a computer.
 - How the memory and the processor can be connected? Explain with diagram.
 - Perform with 2's complement arithmetic: $-34+22$
 - List and explain in brief main features of fourth generation computers.
 - List the steps needed to execute the machine instruction. Load R2, LOC
 - Design half-adder circuit.
- 3. Attempt the following (Any Three) :**
- Explain Big - Endian and Little - Endian Assignments.
 - What are addressing modes? Why different addressign modes are required? Explain different RISC - type addressing modes.
 - Compare RISC and CISC instruction sets.
 - A typical computer must support instructions capable of performing four types of operations. List and explain these operations with at least one instruction.
 - What is an assembler? What is object program?
 - Consider instruction:
- $$C \leftarrow [A] + [B]$$
- With neat figure show a possible program segment for this task as it appears in the memory of a computer.
- 4. Attempt the following (Any Three) :**
- List and explain with neat diagram main hardware components of processor.
 - Consider the RISC Style Load instructin
Load RS, x(R7)
 - Examine the actions involved in fetching and executing the above instruction.
 - Explain with neat diagram conceptual view of the hardware needed for computation.

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- d) Explain 5-stage organization with neat figure. What is Datapath?
 - e) Explain with example sequence of actions needed to fetch and execute an unconditional branch instruction.
 - f) How the processor generates the control signals that cause these actions to take place in the correct sequence and at the right time?

5. Attempt the following (Any Three) :

15

* * * * *

Answer any three from the following : (Each of 5Marks)

15

- (a) What is the difference between user defined function and anonymous function ?
- (b) Write a short note on List Comprehension.
- (c) Explain the following terms of Object Oriented Programming :
 - (i) Class
 - (ii) Methods
- (d) Discuss the concept "Dictionary".
- (e) Define Built-in functions. Explain any 4 built-in functions along with an example.
- (f) Write a program to create an anonymous function to calculate Cube of a number.

Answer any three from the following : (Each of 5Marks)

15

- (a) Define user defined function. Write the syntax to define user defined function. Give example for the same.
 - (b) Illustrate the use of range () in python along with an example.
 - (c) Write a short note on assert statement.
 - (d) What is the difference between interactive and script modes of IDLE?
 - (e) Explain for loop with example.
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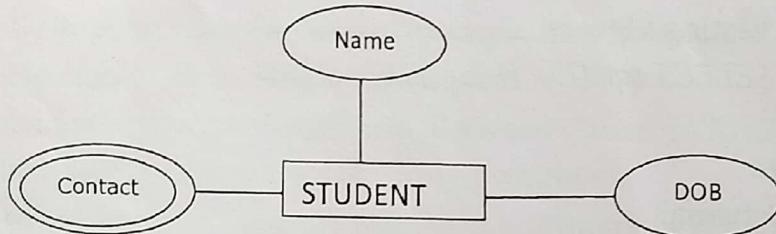
N.B. 1) All questions are **compulsory**.

- 2) Figures to the **right** indicate marks.
- 3) Draw suitable diagrams and illustrations wherever necessary.
- 4) Mixing of sub-questions is **not allowed**.

Q. 1 Attempt All Questions (15M)

(a) **Multiple Choice Questions [05]**

- i) In the architecture of a database system external level is the
 - a. Physical level.
 - b. Logical level.
 - c. Conceptual level
 - d. View level.
- ii) In the figure given below identify the multivalued attribute



- a. Name
- b. Student
- c. DOB
- d. Contact

iii) is a minimal set of attributes whose values uniquely identify an entity in the set.

- a. Primary key
- b. attribute
- c. entity
- d. foreign key

iv) What will be output of calling function $\text{ROUND}(8.4999, 0)$?

- a. 8
- b. 9
- c. Both a and b
- d. None of the above

[TURN OVER]

v) Which of the following clause is mandatorily used in a sub-query?

- a. SELECT
- b. WHERE
- c. ORDER BY
- d. GROUP BY

(b) Fill in the blanks

- i) In an ERD diagram rectangle represent _____. [05]
- ii) If every non-key attribute is functionally depend on the primary key, the relation will be in _____ Normal form.
- iii) In relational algebra, to finds all the tuples that are present in r but not in s, we write it as _____.
- iv) Syntax of creating view is _____.
- v) Output of $\text{SELECT } \sqrt{25};$ is _____.

(c) Short Answers

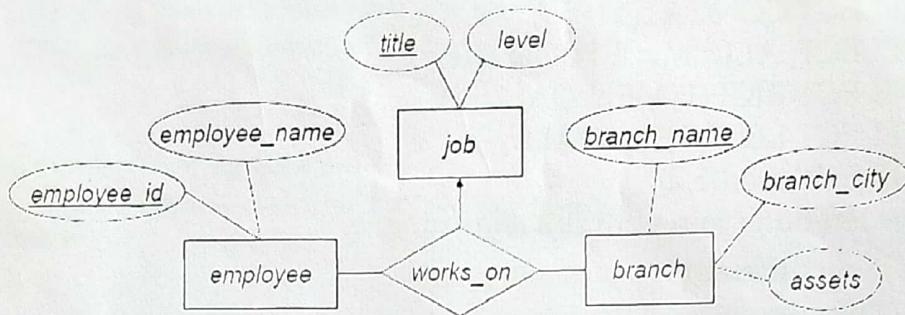
- i) What is Schema? [05]
- ii) What is mean by Logical Data Independence?
- iii) Which symbol is used in relational Algebra for projection?
- iv) State the syntax of selecting all column from table1.
- v) Write a query to retrieve month from the date '2016-10-06'.

Q. 2 Attempt the following (Any THREE)

- (a) Define DBMS. State and explain in brief advantages of DBMS. (15M)
- (b) Write a short note on entities vs attributes.
- (c) State and explain types of attributes with their notations.
- (d) Describe following in short with respect to Relational data model:
 - i) Domain
 - ii) Attributes
- (e) State and explain types of level of abstraction in Database management system.

[TURN OVER]

- (f) Convert following ERD into its table form.



Q. 3 Attempt the following (Any THREE) (15M)

- (a) Write a short note on first normal form.
- (b) Explain 'select' operation of relational Algebra.
- (c) Briefly explain with the help of example how Union and Intersection work in Relational Algebra.
- (d) Explain with proper illustration 'Between clause' in MySQL.
- (e) Write a query to perform following operations:
 - i) Create a table Student with id as a primary key, name as unique key and marks column.
 - ii) Insert a record in it.
 - iii) Modify the existing table by adding a column course to the given table.
 - iv) Add value for existing records for the newly inserted column.
 - v) Delete the table.
- (f) State and explain aggregate functions.

Q. 4 Attempt the following (Any THREE)

- (a) Explain the following functions with example. (15M)
 - i) lower
 - ii) replace
 - iii) abs
 - iv) pow
 - v) reverse

[TURN OVER]

- (b) Write output for following functions:
- SELECT CONCAT('Hello', MY, 'QL');
 - SELECT 'ALL' 'My' 'STUDENTS';
 - SELECT RIGHT('HELLOALL', 3);
 - SELECT LEFT('HELLOALL', 2);
 - SELECT mod(5,2);
- (c) Describe left outer join with suitable example.
- (d) Elaborate on different types of subqueries.
- (e) What is DBA stands for? Explain role of DBA in Database protection.
- (f) Write a MySQL query to create and drop user with and without privileges.

Q. 5 Attempt the following (Any THREE)

- (a) Explain Generalization using diagrammatic representation. (15M)
- (b) Briefly explain lossless join decomposition.
- (c) What are views? State advantages of using views.
- (d) Elaborate on characteristics of relations.
- (e) Write a short note on nested subqueries.
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N.B. (1) All questions are compulsory.
 (2) Figures to the right indicate marks.

1. Answer the following questions (15 M)

- (a) Choose the best choice for the following questions: (5 M)
- (i) If f_1 and f_2 are two functions from \mathbf{R} to \mathbf{R} such that $f_1(x) = x^2$ and $f_2(x) = x - x^2$, then $(f_1 \cdot f_2)(x)$ is given by
 - (a) $x^3 + x^4$
 - (b) $x^3 - x^4$
 - (c) $x^4 + x^3$
 - (d) None of these
 - (ii) Which of the following is true about the poset $(Z^+, |)$?
 - (a) Zero is the least element
 - (b) One is the least element
 - (c) There is no least element
 - (d) None of these
 - (iii) A class contains 10 students with 6 men and 4 women. Number of ways to select a 4-member committee with 2 men and 2 women is given by
 - (a) 60
 - (b) 70
 - (c) 80
 - (d) 90
 - (iv) Suppose a bookcase shelf has 5 History texts, 3 Sociology texts, 6 Anthropology texts, and 4 Psychology texts. Number of ways a student can choose one text of each type is given by
 - (a) 360
 - (b) 460
 - (c) 560
 - (d) 660
 - (v) A loop is an edge connecting
 - (a) a vertex with itself
 - (b) two distinct vertices
 - (c) no vertices
 - (d) three distinct vertices

(b) Fill in the blanks for the following questions: (5M)

- (i) A function f is said to be strictly _____ if $f(x) > f(y)$ for any x and y in the domain of f .
- (ii) A relation R on a set A is called _____ if $(a, a) \in R$ for every element $a \in A$.
- (iii) The Gödel number of a word $w = a_3a_2a_1a_3a_4$ is _____.
- (iv) Suppose that a procedure can be broken down into two tasks. If there are n_1 ways to do the first task and n_2 ways to do the second task after the first task has been done, then there are _____ ways to do the procedure.
- (v) Let G be a directed graph and v be a vertex of G . The number of edges beginning at v is called _____.

(c) Answer the following questions: (5M)

- (i) Why is f , defined by $f(x) = 1/(x+1)$, not a function from \mathbf{R} to \mathbf{R} ?
- (ii) Let $\{a_n\}$ be a sequence that satisfies the recurrence relation $a_n = a_{n-1} + 2$ for $n = 1, 2, 3, \dots$ and suppose that $a_0 = 2$. What are a_1 and a_2 ?

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- (iii) State inclusion exclusion principle.
- (iv) Define a regular grammar.
- (v) Define a directed graph.

(15 M)

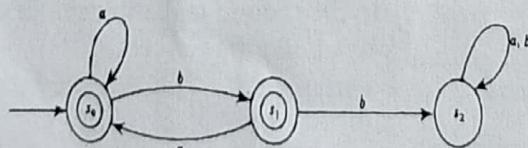
2. Answer any three of the following:

- (a) Find the domain and range of the following functions:
 - i) the function that assigns to each nonnegative integer its last digit.
 - ii) the function that assigns to a bit string the number of bits in the string.
- (b) Determine whether the function f from \mathbb{R} to \mathbb{R} defined by $f(x) = x - 2$ is bijective.
- (c) Suppose that R is the relation on the set of strings of English letters such that aRb if and only if $l(a) = l(b)$, where $l(x)$ is the length of the string x . Is R an equivalence relation? Justify your answer.
- (d) Define Lattice. Determine whether the posets $(\{1, 2, 3, 4, 5\}, |)$ and $(\{1, 2, 4, 8, 16\}, |)$ are lattices.
- (e) Solve the recurrence relation $a_n = 5a_{n-1} - 6a_{n-2}$ for $n \geq 2$, $a_0 = 1$, $a_1 = 0$.
- (f) Define Fibonacci numbers. Formulate a recurrence relation for Fibonacci numbers.

(15 M)

3. Answer any three of the following:

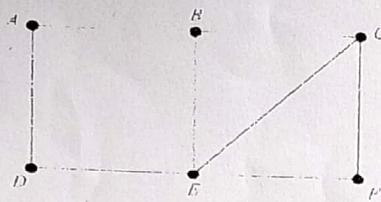
- (a) How many ways are there for eight men and five women to stand in a line so that no two women stand next to each other?
- (b) State and prove Vandermonde's identity.
- (c) State Pigeonhole principle. From any set of 13 integers, prove that there will be at least one pair which leaves the same remainder when divisible by 12.
- (d) How many integers between 1 and 600 (both inclusive) are not divisible by both 3 and 5?
- (e) Define a language L over an alphabet A . Let $A = \{a, b, c\}$. Find L^* where language $L = \{b^2\}$.
- (f) Determine whether or not the automaton M in the following figure accepts the words: $w_1 = ababba$; $w_2 = baab$; $w_3 = \lambda$ the empty word.



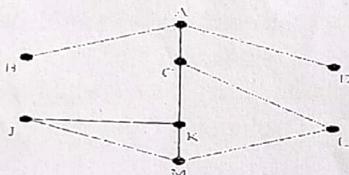
4. Answer any three of the following:

- (a) Consider the graph G in the following. Find (i) $\text{diam}(G)$, the diameter of G , (ii) $d(A, F)$, the distance from A to F .

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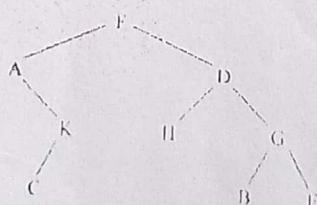
- (b) Consider the graph G in the following figure (where the vertices are ordered alphabetically). (i) Find the adjacency structure of G . (ii) Find the order in which the vertices of G are processed using a depth-first search algorithm beginning at vertex A .



- (c) Draw the graph G corresponding to each adjacency matrix:

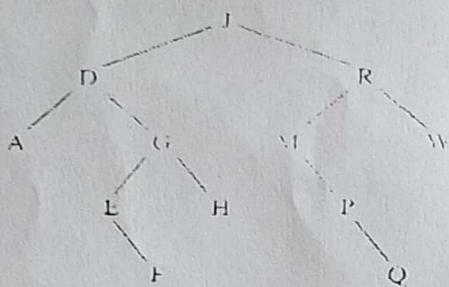
$$\begin{bmatrix} 1 & 3 & 0 & 0 \\ 3 & 0 & 1 & 1 \\ 0 & 1 & 2 & 2 \\ 0 & 1 & 2 & 0 \end{bmatrix}$$

- (d) Consider the binary tree T in the following figure. (i) Find the depth d of T .
(ii) Traverse T using the post-order algorithm.



- (e) Suppose a graph G contains two distinct paths from a vertex u to a vertex v . Show that G has a cycle.
(f) Consider the binary tree T in the following figure. Describe the tree T after (i) the node M and (ii) the node D are deleted.

TURN OVER

5. Answer any *three* of the following:

(15 M)

- (a) Draw the Hasse diagram for divisibility on the set $\{1, 2, 3, 5, 7, 11, 13\}$.
- (b) How many solutions does the equation $x+y+z=11$ have, where x, y and z are non-negative integers with $x \leq 3, y \leq 4$ and $z \leq 6$?
- (c) Draw all possible non similar binary trees T with four external nodes.
- (d) Show that $a_n = n \cdot 2^n$ is a solution of the non-homogeneous linear recurrence relation $a_n = 2a_{n-1} + 2^n$.
- (e) What is the language generated by phase structure grammar G ?

- N.B. 1) All questions are compulsory.
 2) Figures to the right indicate marks.
 3) Illustrations, in-depth answers and diagrams will be appreciated.
 4) Mixing of sub-questions is not allowed.
 5) Use of own non-programmable calculator is allowed.

Q. 1 Attempt All(Each of 5Marks) 15

(a) Multiple Choice Questions

- If $\beta_{YX} < 1$, then β_{XY} is
 - Less than 1
 - Greater than 1
 - Equal to 1
 - Equal to 0
- If correlation coefficient will have positive sign then
 - X is increasing and Y is decreasing
 - Both X and Y are increasing
 - X is increasing and Y is decreasing
 - None of the above
- For two independent events A and B, $P(A) = 0.3$ and $P(B) = 0.4$ than
 $P(A \cap B) = \text{---}$
 - 0.12
 - 0.3
 - 0.4
 - 0.2
- If the lower and upper limits of a class are 10 and 40 then the class-mark (mid point) of the class is---
 - 25.0
 - 12.5
 - 15.0
 - 30.0
- The measure of central value which can not be calculated with open-end classes in case of grouped frequency distribution is ---
 - Median
 - Mean
 - Mode
 - Third quartile

(b) Fill in the blanks

- Median is same as --- quartile.
- More than cumulative frequency is --- in nature.
- The average of the upper and lower class boundaries is called as---.

[TURN OVER

- iv. If correlation coefficient between X and Y is perfect then regression lines of X on Y and Y on X are---.

v. $P(A \cup A') = \dots$

(c) Short Answers

- Define mutually exclusive events.
- State the probability of union of two events when they are independent.
- State relation between mean, median and mode when frequency distribution is positively skewed
- State range of correlation coefficient.
- State relation between probabilities of two events A and B when B is subset of A.

Q. 2 Attempt the following (Any THREE)(Each of 5Marks)

15

- (a) Define mean, median and mode. Explain how to calculate them for continuous frequency distribution.
- (b) Explain the procedure of drawing less than ogive curve for continuous frequency distribution.
- (c) Prepare frequency distribution for the following data on number of mangoes; 3,0,0,1,3,2,1,0,4,2,3,3,0,1,3,2,1,4,3,2,0,1,4,2,1,1,1,3,2,2.
- (d) Represent the following information using Histogram.

Monthly income	50-100	100-150	150-200	200-250	250-300
Number of employees	30	50	100	40	30

- (e) Explain the concepts of discrete and continuous variable using illustrations.
- (f) Find mean, variance, and standard deviation for the following data. 90,99,70,32,76, 68,75,31,39,89,40,66,42,93,53,97,43,92,95,36,67,55,47,37.

Q. 3 Attempt the following (Any THREE) (Each of 5Marks)

15

- (a) Define first four raw moments about zero and first four central moments. Write down the relations between raw and central moments.
- (b) What do you understand by kurtosis? Distinguish clearly by drawing figures between leptokurtic and platykurtic.
- (c) For the following frequency distribution obtain coefficient of skewness based on quartiles.

Marks	20-30	30-40	40-50	50-60	60-70	70-80
Number of students	5	20	14	10	8	5

- (d) Represent the positive and negative correlation coefficient by scatter diagram.
- (e) Explain the concept of correlation and regression. How regression is different than correlation?

- (f) For the following data obtain coefficient of regression line of X on Y.

X	45	44	50	53	66	30	48
Y	42	40	41	42	56	30	43

- Q. 4** Attempt the following (Any THREE) (Each of 5Marks) 15
- (a) Explain the following concepts;
- Sample space
 - Independent events.
- (b) Define conditional probability and state Bayes' theorem.
- (c) The probability that a student passes a Physics test is $2/3$ and the probability that he passes both the Physics test and English test is $14/45$. The probability that he passes at least one test is $4/5$. What is the probability that he passes the English test?
- (d) A box contains 6 red, 4 white and 5 black balls. A person draws 4 balls from the box at random. Find the probability that among the balls drawn there is at least one ball of each colour.
- (e) In 2002 there will be three candidates for the position of principal, Dr. X, Dr. Y and Dr. Z - whose chances of getting the appointment are in the proportion 4:2:3 respectively. The probability that Dr. X if selected would introduce co-education in the college is 0.3. The probabilities of DR. Y and Dr. Z doing the same are respectively 0.5 and 0.8.
 - What is the probability that there will be co-education in the college in 2003?
 - If there is co-education in the college in 2003, what is the probability that Dr. Z is the principal?
- (f) Bag I contains 6 blue and 4 red balls. Bag II contains 2 blue and 6 red balls. Bag III contains 1 blue and 8 red balls. A bag is chosen at random and two balls are drawn without replacement from this bag. Both the balls were blue. Find the probability that bag II was chosen.

- Q. 5** Attempt the following (Any THREE) (Each of 5Marks) 15
- (a) Define variance, standard deviation and coefficient of variation. Explain how to calculate them for raw data.
- (b) Explain regression model and write the properties of regression coefficient.
- (c) An MBA applies for a job in two firms X and Y. The probability of his being selected in firm X is 0.7 and being rejected at Y is 0.5. The probability of at least one of his applications being rejected is 0.6. What is probability that he will be selected in one of the firms.
- (d) The probabilities of X, Y, and Z becoming managers are $4/9$, $2/9$ and $1/3$ respectively. The probabilities that the bonus scheme will be introduced if X, Y, and Z becomes managers are $3/10$, $1/2$, $4/5$ respectively.
 - What is the probabilities that bonus scheme will be introduced and
 - If the bonus scheme has been introduced, what is the probability that the manager appointed was X ?
- (e) Represent the following data by Stem and Leaf diagram:
 86, 46, 44, 68, 47, 81, 77, 48, 50, 87, 41, 88, 59, 80, 52, 85, 56, 61, 58, 72, 69, 82, 78, 60, 54, 71.

(2 1/2 Hours)

[Total Marks: 75]

- N.B. 1) All questions are compulsory
 2) Figures to the right indicate marks
 3) Draw suitable diagrams and illustrations wherever necessary.
 4) Mixing of sub-questions is not allowed.

Q. 1 Attempt All the Questions**A. Choose the correct alternative**

- i. Recognising emotions, understanding emotions, regulating emotions are examples of _____ competencies.
 a) professional b) personal
 c) interpersonal d) social
- ii. Emotional intelligence is made up of _____ core skills.
 a) four b) six
 c) three d) five
- iii. The three element that combine to make 3M model of communication include message, media and _____.
 a) Motive b) Material
 c) Meaning d) Measurable
- iv. WATNA stand for _____ Alternative to a Negotiated Agreement.
 a) Worst b) White
 c) Wise d) None of these
- v. The success of a company depends greatly on the _____ and development of its employees.
 a) responsibility b) motivation
 c) salary d) none of these.

(5M)

B. Fill in the blanks (Choose one from the pool)

{Transcription, Communication, Blue hat, Red hat, Shorter, Longer, Meeting, Six, Interview, four}

- i. _____ is defined as the transfer of information through exchange of speech, messages, signs, visual effects, behaviour etc.
- ii. _____ is associated with process-control, overview, agenda of thinking steps, summaries, conclusions, decisions.
- iii. Resumes are _____ than curriculum vitae.
- iv. _____ is a purposeful talk between two people.
- v. De Bono's proposed the _____ Thinking Hats Method.

[TURN OVER

C. Explain the following terms in one or two lines (5M)

- i) Johari's Window
- ii) Scannable Resume
- iii) Traits
- iv) Job Enrichment
- v) Impact of positive and negative thinking

Q.2 Attempt the following: (Any THREE) (15M)

- A. Briefly describe the components of Emotional Intelligence.
- B. What is 3M Model of Communication? Explain.
- C. Write a note on non-verbal communication.
- D. Highlight the characteristics of communication in digital world.
- E. Write a note on Technology Etiquette.
- F. Write a short note on virtues of listening.

Q.3 Attempt the following: (Any THREE) (15M)

- A. Differentiate between resume and curriculum vitae.
- B. What is meant by cover letter? Highlight its importance.
- C. Briefly describe the steps in planning a presentation.
- D. Write a note on types of interview.
- E. Difference between Group Discussion, Panel Discussion and Debate.
- F. What is the importance of work ethics?

Q.4 Attempt the following: (Any THREE) (15M)

- A. What is capacity building? List various strategies for capacity building.
- B. What are the traits of a good leader? Explain.
- C. What are the different stages of team building?
- D. Highlight the significance of decision making and negotiation.
- E. Write a note on decision making techniques.
- F. What are the signs of stress? What are its sources?

Q.5 Attempt the following: (Any THREE) (15M)

- A. Write a note on interview skills.
- B. Write a note on negotiation styles.
- C. What are the healthier ways to combat stress? Explain.
- D. List and describe about types of teams.
- E. Write a note on 4 Ds of Email Decision Making.