2016

Time : 3 hours

Full Marks : 80

The questions are of equal value.

*Answer **all** questions.*

(DATA STRUCTURE)

1. (a) Define Algorithm. Explain various algorithmic notations for control structures. What is meant by complexity of an algorithm ?

   (b) Write an algorithm to reverse the order of the items stored in an one dimensional array.

OR

   (c) Write an algorithm to read the elements of a 4×5 matrix.

   (d) Define record. What is record structure ? How records are represented in memory ?

2. (a) Write the properties of a Circular Queue. Develop an algorithm to delete items from a circular queue.

(b) Write a procedure to delete the n-th item of a double linked list.

OR

(c) Explain how a stack can be used to evaluate a recursive function.

(d) What is a priority queue ? How items are inserted into such a queue ? Discuss an application of priority queue.

3. (a) What is meant by traversal of a Binary Tree ? Present a recursive algorithm for post order traversal.

(b) Construt a binary search tree with the words presented in the following order :

(i) Orange

(ii) Apple

(iii) Grapes

(iv) Banana

(v) Pineapple

(vi) Berry

(vii) Watermelon

(viii) Cheery

OR

(c) What is a threaded Binary Tree ? How is it represented ? What are its advantages over a normal binary tree ?

(d) Write an iterative procedure to traverse a binary tree using inorder traversal.

4. (a) Write an algorithm for linear search. Analyze it for its time complexity.

(b) Write an algorithm for Bubble sort. Find its time complexity.

OR

(c) Compare the efficiency of Bubble sort with that of Selection sort.

(d) What is Merging ? Explain merge sort with an example.

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(INFORMATION TECHNOLOGY APPLICATION)

1. (a) Describe the basic anatomy of a digital computer with a block diagram.

   (b) Explain the use of different commonly used secondary storage devices.

OR

   (c) Briefly discuss the classification of computers.

(d) Explain the use of different input and output devices.

2. (a) What is Binary Arithmetic ? How are they performed ?

(b) How data are represented using hexadecimal number system ? Convert the hexadecimal number (4B.2A) to its equivalent decimal and binary representation.

OR

(c) What is 2's Complement ? Perform the following subtractions of binary numbers using 2's complements :

(i) 1101 – 1001

(ii) 101 – 111

(d) How data are represented using octal number system ? Convert the octal number (46.57) to its equivalent decimal and binary representation.

3. (a) Distinguish between machine level and assembly level languages.

(b) What is time sharing operating system ? Write its advantage over batch processing.

OR

(c) Distinguish between online and real time processing. Give examples in each case.

(d) What are library and utility programs ? Write their usage with examples.

4. (a) What is Word Processing ? Discuss on the options available for paragraph formatting.

(b) Write the steps to create an Employee database using MS Access.

OR

(c) Discuss some features of Power Point to prepare attractive presentations.

(d) Write the steps to do the following using MS Excel :

(i) Find the sum of values in a column

(ii) Insert a formula in a cell

(iii) Draw a Bar graph

(iv) Format the columns

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(FOUNDATION COURSE IN MATHEMATICS)

(MATH – I)

1. (a) Define statement and verify that $(p \rightarrow q) \rightarrow [(q \rightarrow r) \rightarrow (p \rightarrow r)]$ is a tautology by using truth table.

   (b) Prove that $7 \times 5^{2n-1} + 2^{3n+1}$ is divisible by 17 for every natural number $n \geq 1$ by using induction method.

OR

   (c) Let A, B are two sets. Then prove that :

   (i) $A \Delta B = (A \cup B) \setminus (A \cap B)$

(ii) $A \setminus \bigcup_{i=1}^{n} B_i = \bigcup_{i=1}^{n} (A \setminus B_i)$

(d) (i) Define a relation $\sim$ on $N \times N$ by $(a, b) \sim (c, d)$ if $a + d = c + b$, then prove that N is an equivalence relation on $N \times N$.

(ii) Define injective and surjective functions with examples.

2. (a) If $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$, then show that

$A^3 - 23A - 40I = 0$.

(b) Solve the following equations by using matrix method :

$x + y + z = 4$

$2x - y + 3z = 1$ and

$3x + 2y - z = 1$

OR

(c) (i) How many 5-digit odd numbers with distinct digits can be formed with digits 0, 1, 2, 3, 4 ?

(ii) In how many ways six balls can be drawn from a bag containing 4 black and 5 white balls. Find also the number of ways such that at least 3 black balls can be drawn.

(d) (i) In how many ways can six men and seven girls sit in a row so that the girls always sit together ?

(ii) Solve : $2n_{C_3} : n_{C_3} = 44 : 5$.

3. (a) (i) Prove that G is an abelian group, then for all $a, b \in G$ and all integers n, $(a \cdot b)^n = a^n \cdot b^n$.

(ii) Let G be the set of real 2×2 matrices $\begin{pmatrix} a & 0 \\ 0 & a^{-1} \end{pmatrix}$ where $a \neq 0$. Prove that G is an abelian group under matrix multiplication.

(b) Define the following :

(i) Cyclic group

(ii) Normal subgroup

(iii) Right cosets of a subgroup

(iv) Center of a group

OR

(c) If H is a subgroup of G and N is a normal subgroup of G, then show that $H \cap N$ is a normal subgroup of G.

(d) State and prove Lagrange's theorem.

4. (a) Write the dual of each statements given below :

(i) $(x + y)(x + 1) = x + xy + y$

(ii) If $x + y = x + z$ and $x' + y = x' + z$, then $y = z$.

(b) Prove that :

(i) $(x + y)(x' y') = 0$

(ii) $(x + y) + x' y' = 1$

OR

(c) (i) What is Subgraph ?

(ii) What is component of a graph ?

(iii) If a graph is connected, then how many components does it have ?

(iv) Define degree of a vertex.

(d) (i) Find out the maximum number of edges in a simple graph with m vertices.

(ii) Write short notes about directed graph with examples.

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The figures in the right-hand margin indicate marks.

*Answer **all** questions.*

(ENGLISH FOR TECHNICAL COMMUNICATION)

1. Answer, any **twenty** of the following, as directed : $1 \times 20 = 20$

   (a) You must dispense _____ his services. (Fill the blank)

   (b) Choose the correct prepositional word given in the bracket and fill up the blank :

   Speak loudly as he is slow _____ hearing. (at / in /of/about)

(c) Physics (is/are) a difficult subject.

(Choose the right one)

(d) One of the books _____ missing.

(Use a verb in agreement with its subject)

(e) Ten dollars _____ not enough.

(Fill up the blank)

(f) Time makes worst enemies friends.

(Insert a suitable article, if necessary)

(g) Could you pass me _____ salt please ? (Fill up the blank)

(h) She said that she _____ (see) that movie.

(Fill up the blank with suitable form of the verb in the bracket)

(i) I _____ (live) here since 1999.

(Fill up the blank with suitable form of 'live')

(j) Anita studied here _____ two days.

(Fill up the blank)

(k) I hate (borrow) money. (Put the verb in the bracket into the gerund form)

(l) It's no use cry over spilt milk.

(Correct the sentence)

(m) Time _____ tide wait for no man.

(Fill in the blank with appropriate conjuction)

(n) Fill in the blank with correct word from the bracket.

_____ you please help me to do this ?

(Shall / Should / Must)

(o) If you had spoken clearly, he (understand) you.

(Put the verb in the bracket in the correct tense)

(p) The bus is very late. This is usual.

(Combine the two sentences by using Adverb or Adverbial phrase)

(q) I saw a snake. I ran away.

(Combine these two sentences)

(r) He is poor. He is honest. (Use : Though)

(s) The patient put up a brave fight.

(Use 'fight as a verb')

(t) "Call the accused", said the judge.

(Write in indirect speech)

(u) Honour the brave. (Change the voice)

(v) Speak the truth. (Change into negative)

2. (a) Make sentences using the following pair of words (any **two** sets) : 2×2 = 4

(i) Advice ; Advise

(ii) Affect ; Effect

(iii) Canon ; Cannon

(b) Write the synonyms of any **four** of the following : 1×4 = 4

(i) Coalition

(ii) Benevolent

(iii) Defer

(iv) Infernal

(v) Paltry

(c) Write the antonyms of any **four** of the following : 1×4 = 4

(i) Economy

(ii) Enrich

(iii) Partner

(iv) Stranger

(v) Thankful

(d) Make sentences using any **four** of the following : 1×4 = 4

(i) To rule the roast

(ii) To make both ends meet

(iii) To go back on

(iv) To hit below the belt

(v) At full blast

(e) Make **one** word substitution of any **four** of the following : 1×4 = 4

(i) A child whose parents are dead

(ii) A talk between two people

(iii) Engaged in war

(iv) A person who readily believes others

(v) Disbeliever in God

3. Answer any **two** of the following :

(a) Transcribe the following words phonetically : 1×10 = 10

(i) Sleep

(ii) Said

(iii) Accident

(iv) Yesterday

(v) Effect

(vi) Education

(vii) Grammatical

(viii) Record

(ix) Monkey

(x) Good

(b) Read the following passage and prepare a note on it : 10

The work which Gandhiji had taken in hand was not only the achievement of political freedom but establishment of an egalitarian social order based on equlity, universal brotherhood and freedom for all. This

unifinished part of his work was perhaps even more difficult to achieve than the achievement of political freedom. In the political struggle, the fight was against a foreign power and all could and did either join in it or at least wished its success and gave to it their moral support. In establishing the social order of his pattern, there was a lively possibility of a conflict arising between groups and classes of our people. Experience shows that man values his possessions more than his life because in the former he sees the means for perpetuation and survival through his descendants even after his body is reduced to ashes. Hence, that new order cannot be established without radically changing men's mind and attitude to property.

(c) Read the passage given at 3.(b) and answer the following questions : 2×5 = 10

(i) What are the works which Gandhiji wanted to do ?

(ii) Which one of those works was easier to achieve and why ?

(iii) What was the difficulty with other work ?

(iv) What causes that difficulty ?

(v) How can the difficulty be over come ?

(d) You are the Secretary of your youth club. Prepar a report containing your achievements in the field of social service that your club rendered in the year 2015. 10

4. (a) Write a letter to the Block Development Officer of your Block for issuing you a Ration Card. 10

(b) Write an essay about **250** words on any **one** of the following : 10

(i) The most amusing experience in your life

(ii) The advantages and disadvantages of Co-education