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10MAT41

**Fourth Semester B.E. Degree Examination, June/July 2013**  
**Engineering Mathematics – IV**

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer FIVE full questions, selecting at least TWO questions from each part.**  
**2. Use of Statistical tables permitted.**

**PART – A**

- 1 a. Use modified Euler's method to solve  $\frac{dy}{dx} = x + y$ ,  $y(0) = 1$  at  $x = 0.1$  for three iterations taking  $h = 0.1$ . (06 Marks)
- b. Solve  $\frac{dy}{dx} = x + y$ ,  $x = 0$ ,  $y = 1$  at  $x = 0.2$  using Runge-Kutta method. Take  $h = 0.2$ . (07 Marks)
- c. Using Milne's predictor-corrector method find  $y(0.3)$  correct to three decimals given, (07 Marks)

x	-0.1	0	0.1	0.2
y	0.908783	1.0000	1.11145	1.25253

- 2 a. Approximate  $y$  and  $z$  at  $x = 0.2$  using Picard's method for the solution of  $\frac{dy}{dx} = z$ ,  $\frac{dz}{dx} = x^3(y + z)$  with  $y(0) = 1$ ,  $z(0) = 1/2$ . Perform two steps ( $y_1, y_2, z_1, z_2$ ). (10 Marks)
- b. Using Runge-Kutta method solve  $y'' = x(y')^2 - y^2$  at  $x = 0.2$  with  $x_0 = 0$ ,  $y_0 = 1$ ,  $z_0 = 0$  take  $h = 0.2$ . (10 Marks)
- 3 a. If  $f(z) = u + iv$  is analytic prove that Cauchy-Reimann equations  $u_x = v_y$ ,  $u_y = -v_x$  are true. (06 Marks)
- b. If  $w = z^3$  find  $dw/dz$ . (07 Marks)
- c. If the potential function is  $\phi = \log \sqrt{x^2 + y^2}$ . Find the stream function. (07 Marks)
- 4 a. Find the bilinear transformation which maps the points  $z = 1, i, -1$  onto the points  $w = j, o, -i$ . (06 Marks)
- b. Discuss the conformal transformation  $w = e^z$ . Any horizontal strip of height  $2\pi$  in  $z$ -plane will map what portion of  $w$ -plane. (07 Marks)
- c. State and prove Cauchy's integral formula. (07 Marks)

**PART – B**

- 5 a. Prove that  $J_{1/2}^{(x)} = \sqrt{\frac{2}{\pi x}} \sin x$ . (06 Marks)
- b. State and prove Rodrigues formula for Legendre's polynomials. (07 Marks)
- c. Express  $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$  in terms of Legendre polynomial. (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

- 6 a. The probabilities of four persons A, B, C, D hitting targets are respectively  $1/2$ ,  $1/3$ ,  $1/4$ ,  $1/5$ . What is the probability that target is hit by atleast one person if all hit simultaneously? (06 Marks)
- b. i) State addition law of probability for any two events A and B.  
 ii) Two different digits from 1 to 9 are selected. What is the probability that the sum of the two selected digits is odd if '2' one of the digits selected. (07 Marks)
- c. Three machine A, B, C produce 50%, 30%, 20% of the items. The percentage of defective items are 3, 4, 5 respectively. If the item selected is defective what is the probability that it is from machine A? Also find the total probability that an item is defective. (07 Marks)

- 7 a. The p.d.f of x is

x	0	1	2	3	4	5	6
p(x)	k	3k	5k	7k	9k	11k	13k

Find k. Also find  $p(x \geq 5)$ ,  $p(3 < x \leq 6)$ . (06 Marks)

- b. A die is thrown 8 times. Find the probability that '3' falls,  
 i) Exactly 2 times  
 ii) At least once  
 iii) At the most 7 times. (07 Marks)
- c. In a certain town the duration of shower has mean 5 minutes. What is the probability that shower will last for i) 10 minutes or more; ii) less than 10minutes; iii) between 10 and 12 minutes. (07 Marks)
- 8 a. What is null hypothesis, alternative hypothesis significance level? (06 Marks)
- b. The nine items of a sample have the following values: 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these differ significantly from the assumed mean of 47.5. Apply student's t-distribution at 5% level of significance. ( $t_{0.05}$  for 8df = 2.31). (07 Marks)
- c. In experiments on a pea breeding, the following frequencies of seeds were obtained:

Round-yellow	Wrinkled yellow	Round green	Wrinkled green	Total
315	101	108	32	556

Is the experiment is in the agreement of theory which predicts proportion of frequencies 9:3:3:1 ( $\chi^2_{0.05, 3df} \approx 7.815$ ). (07 Marks)

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**Fourth Semester B.E. Degree Examination, June/July 2013**  
**Graph Theory and Combinatorics**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting  
at least TWO questions from each part.**

**PART – A**

- 1 a. i) Define connected graph. Give an example of a connected graph  $G$  where removing any edge of  $G$  results in a disconnected graph.  
 ii) Define complement of a graph. Find an example of a self-complementary graph on four vertices and one on five vertices. (06 Marks)
- b. Find all (loop-free) non-isomorphic undirected graphs with four vertices. How many of these graphs are connected? (05 Marks)
- c. Show that the following graphs in Fig. Q1 (c) are isomorphic: (05 Marks)

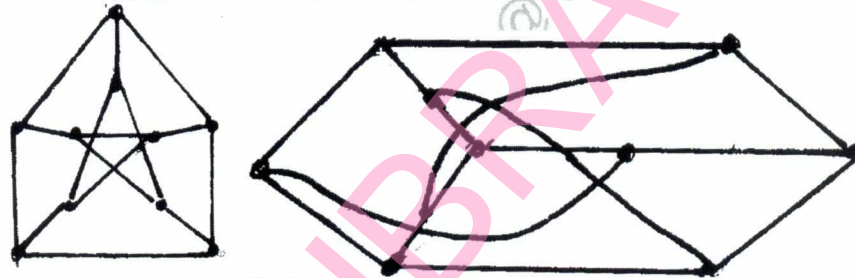


Fig. Q1 (c)

- d. How many different paths of length 2 are there in the undirected graph  $G$  in Fig. Q1 (d)? (04 Marks)

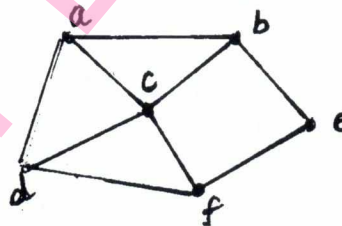


Fig. Q1 (d)

- 2 a. Define Hamilton cycle. How many edge-disjoint Hamilton cycles exist in the complete graph with seven vertices? Also, draw the graph to show these Hamilton cycles. (06 Marks)
- b. Define Planar graph. Let  $G = (V, E)$  be a connected planar graph or multigraph with  $|V| = v$  and  $|E| = e$ . Let  $r$  be the number of regions in the plane determined by a planar embedding of  $G$ . Then prove that  $v - e + r = 2$ . (07 Marks)
- c. i) Find the chromatic number of the complete bipartite graph  $K_{m,n}$  and a cycle,  $C_n$  on  $n$  vertices,  $n \geq 3$ .  
 ii) Determine the chromatic polynomial for the graph  $G$  in Fig. Q2 (c). (07 Marks)

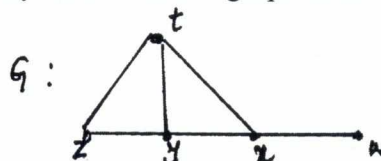


Fig. Q2 (c)

- 3 a. i) Prove that in every tree  $T = (V, E)$ ,  $|E| = |V| - 1$ .  
 ii) Let  $F_1 = (V_1, E_1)$  be a forest of seven trees, where  $|E_1| = 40$ . What is  $|V_1|$ ? (07 Marks)
- b. Define : i) Spanning tree ii) Binary rooted tree. Find all the nonisomorphic spanning trees of the graph. Fig. Q3 (b). (06 Marks)

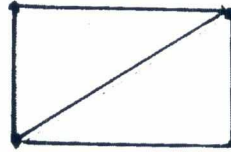


Fig. Q3 (b)

- c. Define prefix code. Obtain an optimal prefix code for the message ROAD IS GOOD. Indicate the code. (07 Marks)

- 4 a. Apply Dijkstra's algorithm to the digraph shown in Fig. Q4 (a) and determine the shortest distance from vertex a to each of the other vertices in the graph. (07 Marks)

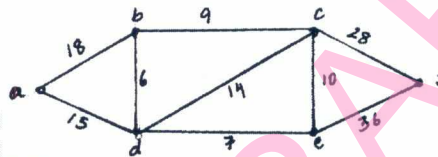


Fig. Q4 (a)

- b. Define the following with respect to a graph: i) matching ii) a cut-set. Show that the graph in Fig. Q4 (b) has a complete matching from  $V_1$  to  $V_2$ . Obtain two complete matching. (07 Marks)

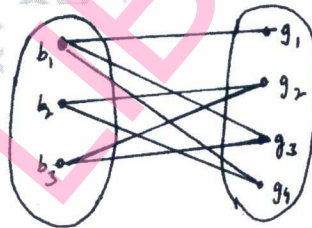


Fig. Q4 (b)

- c. For the network shown in Fig. Q4 (c), find the capacities of all the cutsets between A and D, and hence determine the maximum flow between A and D. (06 Marks)

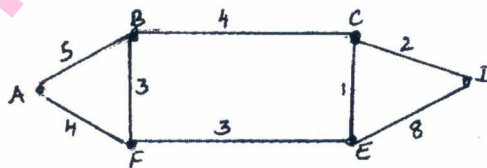


Fig. Q4 (c)

**PART - B**

- 5 a. How many arrangements of the letters in MISSISSIPPI have no consecutive S's? (05 Marks)
- b. i) Find the coefficient of  $v^2w^4xz$  in the expansion of  $(3v + 2w + x + y + z)^8$ .  
 ii) How many distinct terms arise in the expansion in part (i)? (05 Marks)
- c. How many positive integers n can we form using the digits 3, 4, 4, 5, 5, 6, 7 if we want n to exceed 5000000? (05 Marks)
- d. A message is made up of 12 different symbols and is to be transmitted through a communication channel. In addition to the 12 symbols, the transmitter will also send a total of 45 blank spaces between the symbols, with at least three spaces between each pair of consecutive symbols. In how many ways the transmitter sends such a message? (05 Marks)

- 6 a. In how many ways can the 26 letters of the alphabet be permuted so that none of the patterns spin, game, path or net occurs? (07 Marks)
- b. Define derangement. In how many ways can each of 10 people select a left glove and a right glove out of a total of 10 pairs of gloves so that no person selects a matching pair of gloves? (06 Marks)
- c. Five teachers  $T_1, T_2, T_3, T_4, T_5$  are to be made class teachers for five classes  $C_1, C_2, C_3, C_4, C_5$ , one teacher for each class.  $T_1$  and  $T_2$  do not wish to become the class teachers for  $C_1$  or  $C_2$ ,  $T_3$  and  $T_4$  for  $C_4$  or  $C_5$  and  $T_5$  for  $C_3$  or  $C_4$  or  $C_5$ . In how many ways can the teachers be assigned the work? (07 Marks)
- 7 a. Find the generating function for the following sequences:  
 i)  $1^2, 2^2, 3^2, 4^2, \dots$     ii)  $0^2, 1^2, 2^2, 3^2, \dots$     iii)  $0, 2, 6, 12, 30, \dots$  (06 Marks)
- b. Use generating function to determine how many four element subsets of  $S = \{1, 2, 3, \dots, 15\}$  contain no consecutive integers? (07 Marks)
- c. Using exponential generating function, find the number of ways in which 4 of the letters in the words given below be arranged: i) ENGINE    ii) HAWAII (07 Marks)
- 8 a. The number of virus affected files in a system is 1000 (to start with) and this number increases 250% every two hours. Use a recurrence relation to determine the number of virus affected files in the system after one day. (05 Marks)
- b. Solve the recurrence relation:  
 $a_{n+2} - 10a_{n+1} + 21a_n = 3n^2 - 2, \quad n \geq 0$  (07 Marks)
- c. Using the generating function method, solve the recurrence relation,  
 $a_n - 3a_{n-1} = n, \quad n \geq 1$  given  $a_0 = 1$  (08 Marks)

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**Fourth Semester B.E. Degree Examination, June/July 2013**  
**Design and Analysis of Algorithms**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting at least TWO questions from each part.**

**PART – A**

1. a. What is an algorithm? What are the properties of an algorithm? Explain with an example. (08 Marks)  
 b. Explain brute force method for algorithm design and analysis. Explain the brute force string matching algorithm with its efficiency. (08 Marks)  
 c. Express using asymptotic notation i)  $n!$  ii)  $6 * 2^n + n^2$ . (04 Marks)
2. a. Explain divide and conquer technique. Write the algorithm for binary search and find average case efficiency. (10 Marks)  
 b. What is stable algorithm? Is quick sort stable? Explain with example. (06 Marks)  
 c. Give an algorithm for merge sort. (04 Marks)
3. a. Explain the concept of greedy technique for Prim's algorithm. Obtain minimum cost spanning tree for the graph below Prim's algorithm. (09 Marks)

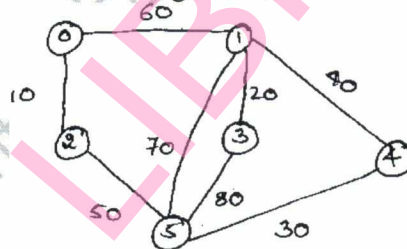


Fig.Q.3(a)

- b. Solve the following single source shortest path problem assuming vertex 5 as the source. (09 Marks)

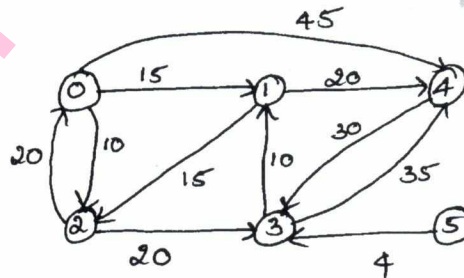


Fig.Q.3(b)

- c. Define the following: i) Optimal solution; ii) Feasible solution. (02 Marks)
4. a. Using Floyd's algorithm solve the all pair shortest problem for the graph whose weight matrix is given below:

$$\begin{bmatrix} 0 & \infty & 3 & \infty \\ 2 & 0 & \infty & \infty \\ \infty & 7 & 0 & 1 \\ 6 & \infty & \infty & 0 \end{bmatrix}$$

(07 Marks)

- b. Using dynamic programming, solve the following knapsack instance.  
 $N = 4$   $M = 5$   
 $(W_1, W_2, W_3, W_4) = (2, 1, 3, 2)$   
 $(P_1, P_2, P_3, P_4) = (12, 10, 20, 15).$  (05 Marks)
- c. Outline an exhaustive search algorithm to solve traveling salesman problem. (08 Marks)

## PART – B

- 5 a. Write and explain DFS and BFS algorithm with example. (08 Marks)
- b. Obtain topologies sorting for the given diagram using source removal method. (05 Marks)

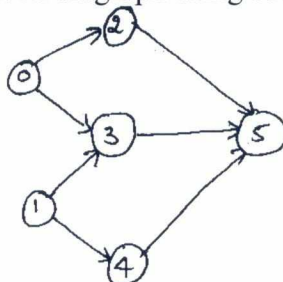


Fig.Q.5(b)

- c. Explain Horspool's string matching algorithm for a text that comprises letters and space (denoted by hyphen) i.e "JIM-SAW-ME-IN-BARBER-SHOP" with pattern "BARBER". Explain its working along with a neat table and algorithm to find shift table. (07 Marks)
- 6 a. Define the following:  
 i) Class P  
 ii) Class NP  
 iii) NP complete problem  
 iv) NP hard problem. (08 Marks)
- b. Write the decision tree to sort the elements using selection sort and find the lower bound. (08 Marks)
- c. What is numeric analysis? (02 Marks)
- d. Brief overflow and underflow in numeric analysis algorithms. (02 Marks)
- 7 a. What is back tracking? Apply back tracking problem to solve the instance of the sum of subset problem:  $S = \{3, 5, 6, 7\}$  and  $d = 15$ . (07 Marks)
- b. With the help of a state space tree, solve the following instance of the knapsack problem by the branch-and-bound algorithm. (06 Marks)

Item	Weight	Value
1	4	40
2	7	42
3	5	25
4	3	12
Knapsack	Capacity	$W = 10$

- c. Explain how backtracking is used for solving 4-queen's problem. Show the state space table. (07 Marks)
- 8 a. What is prefix computation problem? Give the algorithms for prefix computation which uses: i)  $n$  processors; ii)  $n/\log n$  processors. Obtain the time complexities of these algorithms. (10 Marks)
- b. What is super linear speed up? Obtain the maximum speed up when  $P = 10$  and various values of  $f = 0.5, 0.1, 0.01$ . (05 Marks)
- c. What are the different ways of resolving read and write conflicts? (05 Marks)

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**Fourth Semester B.E. Degree Examination, June/July 2013**  
**UNIX and Shell Programming**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting  
at least TWO questions from each part.**

**PART – A**

- 1 a. With a neat diagram, explain the architecture of unix operating system. (08 Marks)
- b. With the help of a neat diagram, explain the parent-child relationship. Explain unix file system. (06 Marks)
- c. Explain briefly absolute pathname and relative pathname with examples. (06 Marks)
- 2 a. Give the significance of the seven fields of the “ls -l” command. (07 Marks)
- b. What is file permission? Explain how to use “Chmod” command to set the permissions in a relative manner with an example. (07 Marks)
- c. Explain the three different modes in which “Vi” editor works. (06 Marks)
- 3 a. Explain the standard input, standard output and standard error with respect to UNIX operating system. (07 Marks)
- b. Explain the mechanism of process creation. (07 Marks)
- c. What are environment variables? Explain any four. (06 Marks)
- 4 a. Differentiate between hard link and soft link with examples. (06 Marks)
- b. Explain “sort” command briefly. Also discuss its important options with examples (any five). (06 Marks)
- c. Explain the following commands with example:  
i) head      ii) tr      iii) uniq      iv) find (08 Marks)

**PART – B**

- 5 a. Explain ‘grep’ command with its options. (08 Marks)
- b. Explain line addressing and context addressing in “sed” with examples. (06 Marks)
- c. What are extended regular expression (ERE)? Explain any four ERE set used by “grep” and “egrep”. (06 Marks)
- 6 a. Explain the use of “test” and [ ] to evaluate an expression in shell. (06 Marks)
- b. Explain the shell features of “while” and “for” with syntax. (06 Marks)
- c. Explain the “expr” command applicable to computation and string functions. (08 Marks)
- 7 a. What is AWK? Explain any three built-in functions in AWK. (07 Marks)
- b. Write short notes on operators and expressions in AWK. (06 Marks)
- c. Explain built-in variables in AWK. (07 Marks)
- 8 a. List the string handling functions in PERL. Write a program to find number of characters, words as well as to print reverse of a given string. (08 Marks)
- b. Explain “chop( )” and “split( )” functions with examples. (06 Marks)
- c. Explain file handling in PERL. (06 Marks)



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10CS45

**Fourth Semester B.E. Degree Examination, June/July 2013**  
**Microprocessors**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting  
at least TWO questions from each part.**

**PART – A**

1.
  - a. Draw the physical memory system diagram for intel Pentium microprocessors. (06 Marks)
  - b. Discuss the functions of segment registers of 8086 with examples. Give some advantages of memory segmentation. (08 Marks)
  - c. What is pipelining? How is it achieved in 8086? (06 Marks)
  
2.
  - a. Explain how virtual address is translated into physical address with a neat diagram. (08 Marks)
  - b. Identify the addressing modes of the following instructions and explain them briefly:
    - i) MOV WORD PTR [SI], 20H
    - ii) MOV ES : [1000H], 10H
    - iii) MOV CX, NUM[BX + DI]
  - c. Briefly explain the flat mode memory model with a neat diagram. (06 Marks)
  
3.
  - a. Write an ALP using 8086 instructions to search a number placed in location NUM, in an array of ten numbers placed at location ARRAY. Give suitable messages. (08 Marks)
  - b. Describe the following instructions with an example:
    - i) LEA            ii) XCHG            iii) DAA            iv) MUL
  - c. Give the state of all the status flag bits after the addition of 30A2H with F01CH. (04 Marks)
  
4.
  - a. Explain the following assembler directives with examples:
    - i) DB            ii) EXTRN            iii) PROC            iv) SEGMENT.
  - b. Differentiate between procedures and macros. (04 Marks)
  - c. Write an ALP using 8086 instructions to reverse a four digit number. (08 Marks)

**PART – B**

5.
  - a. What is inline assembly? Explain its need. (06 Marks)
  - b. State the C language elements that can be used in the arm block. (06 Marks)
  - c. Explain the basic rules for using assembly language with C/C++ for 16-bit DOS applications with the help of examples. (08 Marks)
  
6.
  - a. Explain the functions of the following pins of 8086 microprocessor:
    - i) ALE            ii) INTR            iii) HOLD            iv) RESET            v) BHE
  - b. Explain how address demultiplexing is done in 8086 processor based systems. (07 Marks)
  - c. With a neat timing diagram, explain memory read cycle. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 7 a. List various memory devices. (02 Marks)
- b. What is memory address decoding? Design a memory system for 8086 for the following specifications:  
i) 32 Kbytes EPROM using 16 Kbyte devices.  
ii) 64 Kbytes SRAM using 16 Kbyte devices.  
Draw the memory map. (10 Marks)
- c. What are the sources of interrupts? Briefly explain the steps taken by a processor to execute an interrupt instruction. (08 Marks)
- 8 a. Briefly explain the control word format of 8255 in I/O mode and BSR mode. Give the control word format to program Port A and Port C lower as input and Port B and Port C upper as output parts in mode O. (10 Marks)
- b. Write an ALP using 8086 instructions to read a byte of data from Port A and display its parity status as OOH or FFH for odd and even parity respectively, on Port B. (05 Marks)
- c. List the features of 8254 PIT (Programmable Interval Timer). (05 Marks)

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10CS46

**Fourth Semester B.E. Degree Examination, June / July 2013**  
**Computer Organization**

Time: 3 hrs.

Max. Marks:100

**Note:** Answer any FIVE full questions, selecting atleast TWO question from each part.

**PART - A**

1.
  - a. With a neat block diagram, discuss the basic operational concepts of a computer. (06 Marks)
  - b. List the different systems used to represent a signed number and give one example for each. Specify which number representation system is preferred in a computer and why? (04 Marks)
  - c. Perform the following operations on the 5 – bit signed numbers using 2's complement representation system. Also indicate whether overflow has occurred.
    - i)  $(-10) + (-13)$  ii)  $(-10) - (+4)$  iii)  $(-3) + (-8)$  iv)  $(-10) - (+7)$ . (10 Marks)
2.
  - a. Define addressing mode. Explain the following addressing modes with an example for each:
    - i) Index addressing mode ii) Indirect addressing mode iii) Relative addressing mode
    - iv) Auto decrement addressing mode. (10 Marks)
  - b. With a neat block diagram, describe the input and output operations. (05 Marks)
  - c. Discuss briefly encoding of machine instructions. (05 Marks)
3.
  - a. With neat sketches, explain various methods for handling multiple interrupt requests. (12 Marks)
  - b. Define bus arbitration. Explain in detail any one approach of bus arbitration. (08 Marks)
4.
  - a. With a neat diagram, explain in detail the input interface circuit. (10 Marks)
  - b. List out the functions of an I/O interface. (03 Marks)
  - c. Discuss briefly the protocols of universal serial bus. (07 Marks)

**PART - B**

5.
  - a. Briefly explain any two cache mapping functions. (06 Marks)
  - b. With a neat diagram, explain the translation of a virtual address to a physical address. (08 Marks)
  - c. Discuss in detail any one feature of memory design that leads to improved performance of computer. (06 Marks)
6.
  - a. Perform signed multiplication of numbers  $(-12)$  and  $(-11)$  using Booth's algorithm. (08 Marks)
  - b. Given  $A = 10101$  and  $B = 00100$  perform  $A/B$  using restoring division algorithm. (08 Marks)
  - c. Design a logic circuit to perform addition / subtraction of two 'n' bit numbers X and Y. (04 Marks)
7.
  - a. Write down the control sequence for the instruction Add  $R_4, R_5, R_6$  for three – Bus organization. (04 Marks)
  - b. With a neat sketch, explain the organization of a micro programmed control unit. (08 Marks)
  - c. With an example, explain the field coded microinstructions. (08 Marks)
8.
  - a. Describe the working of message passing multicomputer (MPM) architecture. (08 Marks)
  - b. Briefly explain any two parallel computer architecture. (08 Marks)
  - c. List out any four differences between shared memory multiprocessor and cluster. (04 Marks)

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