Fourth Semester B.E. Degree Examination, June/July 2016
Engineering Mathematics – IV

Time: 3 hrs.   Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting*
atleast TWO questions from each part.
2. Use of statistical tables permitted.

PART – A

1. a. Using Taylor's series method, solve $y' = x + y^2$, $y(0) = 1$ at $x = 0.1, 0.2$, considering upto 4th degree term. **(06 Marks)**

   b. Using modified Euler's method, find an approximate value of y when x = 0.2 given that $\frac{dy}{dx} = x + y$ and y = 1 when x = 0. Take h = 0.1. Perform two iterations in each stage. **(07 Marks)**

   c. Using Adams-Bashforth method, obtain the solution of $\frac{dy}{dx} = x - y^2$ at x = 0.8 given that $y(0) = 0$, $y(0.2) = 0.0200$, $y(0.4) = 0.0795$, $y(0.6) = 0.1762$. Apply the corrector formula twice. **(07 Marks)**

2. a. Employing the Picard's method, obtain the second order approximate solution of the following problem at x = 0.2, $\frac{dy}{dx} = x + yz$, $\frac{dz}{dx} = y + zx$, $y(0) = 1$, $z(0) = -1$. **(06 Marks)**

   b. Solve $\frac{dy}{dx} = 1 + xz$ and $\frac{dz}{dx} = -xy$ for x = 0.3 by applying Runge Kutta method given $y(0) = 0$ and $z(0) = 1$. Take h = 0.3. **(07 Marks)**

   c. Using the Milne's method, obtain an approximate solution at the point x = 0.4 of the problem $\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - 6y = 0$ given that y(0) = 1, y(0.1) = 1.03995, y(0.2) = 1.138036, y(0.3) = 1.29865, y'(0) = 0.1, y'(0.1) = 0.6955, y'(0.2) = 1.258, y'(0.3) = 1.873. **(07 Marks)**

3. a. Define an analytic function and obtain Cauchy-Riemann equations in polar form. **(06 Marks)**

   b. Show that $u = e^{2x}(x \cos 2y - y \sin 2y)$ is a harmonic function and determine the corresponding analytic function. **(07 Marks)**

   c. If f(z) is a regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) |f(z)|^2 = 4|f'(z)|^2$. **(07 Marks)**

4. a. Evaluate using Cauchy's integral formula $\int_e \frac{\cos \pi z}{z^2 - 1} dz$ around a rectangle with vertices $2 \pm i$, $-2 \pm i$. **(06 Marks)**

   b. Find the bilinear transformation which maps 1, i, -1 to 2, i, -2 respectively. Also find the fixed points of the transformation. **(07 Marks)**

   c. Discuss the conformal transformation of $w = z^2$. **(07 Marks)**

PART – B

5 a. Reduce the differential equation:

$$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + (k^2 x^2 - n^2)y = 0$$ into Bessel form and write the complete solution in terms of $\tau_n(x)$ and $\tau_{-n}(x)$. **(06 Marks)**

   b. Express $f(x) = x^3 + 2x^2 - x - 3$ in terms of Legendre polynomials. **(07 Marks)**

   c. If α and β are the roots of $\tau_n(x) = 0$ then prove that

$$\int_0^1 x\tau_n(\alpha x)\,\tau_n(\beta x)\,dx = \begin{cases} 0, & \alpha \neq \beta \\ \frac{1}{2}[\tau_{n+1}(\alpha)]^2, & \alpha = \beta \end{cases}$$ **(07 Marks)**

6 a. The probability that sushil will solve a problem is 1/4 and the probability that Ram will solve it is 2/3. If sushil and Ram work independently, what is the probability that the problem will be solved by (i) both of them; (ii) at least one of them? **(06 Marks)**

   b. A committee consists of 9 students two of which are from first year, three from second year and four from third year. Three students are to be removed at random. What is the chance that (i) the three students belong to different classes; (ii) two belong to the same class and third to the different class; (iii) the three belong to the same class? **(07 Marks)**

   c. The contents of three urns are: 1 white, 2 red, 3 green balls, 2 white, 1 red, 1 green balls and 4 white, 5 red, 3 green balls. Two balls are drawn from an urn chosen at random. These are found to be one white and one green. Find the probability that the balls so drawn came from the third urn. **(07 Marks)**

7 a. The probability mass function of a variate X is

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

   i)   Find k
   ii) Find $p(x < 4)$, $p(x \geq 5)$, $p(3 < x \leq 6)$, $p(x > 1)$
   iii) Find the mean. **(06 Marks)**

   b. Derive the mean and variance of Poisson distribution. **(07 Marks)**

   c. The mean height of 500 students is 151cm and the standard deviation is 15cm. Assuming that the heights are normally distributed, find how many students heights i) lie between 120 and 155cm ii) more than 155cm. [Given A(2.07) = 0.4808 and A (0.27) = 0.1064, where A(z) is the area under the standard normal curve from 0 to z > 0]. **(07 Marks)**

8 a. The means of simple samples of sizes 1000 and 2000 are 67.5 and 68.0cm respectively. Can the samples be regarded as drawn from the same population of S.D 2.5cm [Given $z_{0.05}$ = 1.96]. **(06 Marks)**

   b. A random sample of 10 boys had the following I.Q: 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q of 100? [Given $t_{0.05}$ for 9d.f = 2.26]. **(07 Marks)**

   c. The following table gives the number of aircraft accidents that occurred during the various days of the week. Find whether the accidents are uniformly distributed over the week.

Days :	Sun	Mon	Tue	Wed	Thur	Fri	Sat	Total
No. of accidents :	14	16	8	12	11	9	14	84

[Given $\psi^2_{0.05}$ 6d.f = 12.59] **(07 Marks)**

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Fourth Semester B.E. Degree Examination, June/July 2016
Advanced Mathematics – II

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Find the angle between any two diagonals of a cube.   **(07 Marks)**
   b. Prove that the general equation of first degree in x, y, z represents a plane.   **(07 Marks)**
   c. Find the angle between the lines,
       $$\frac{x-1}{1} = \frac{y-5}{0} = \frac{z+1}{5} \text{ and } \frac{x+3}{3} = \frac{y}{5} = \frac{z-5}{2}.$$ **(06 Marks)**

2 a. Prove that the lines,
       $$\frac{x-5}{3} = \frac{y-1}{1} = \frac{z-5}{-2} \text{ and } \frac{x+3}{1} = \frac{y-5}{3} = \frac{z}{5} \text{ are perpendicular.}$$ **(07 Marks)**
   b. Find the shortest distance between the lines.
       $$\frac{x-8}{3} = \frac{y+9}{-16} = \frac{z-10}{7} \text{ and } \frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}.$$ **(07 Marks)**
   c. Find the equation of the plane containing the point (2, 1, 1) and the line,
       $$\frac{x+1}{2} = \frac{y-2}{3} = \frac{z+1}{-1}$$ **(06 Marks)**

3 a. Find the constant 'a' so that the vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} + 2\hat{j} - 3\hat{k}$ and $3\hat{i} + a\hat{j} + 5\hat{k}$ are co-planar.   **(07 Marks)**
   b. If $\vec{a} = 2\hat{i} + 3\hat{j} - 4\hat{k}$ and $\vec{b} = 8\hat{i} - 4\hat{j} + \hat{k}$ then prove that $\vec{a}$ is perpendicular to $\vec{b}$ and also find $\left|\vec{a} \times \vec{b}\right|$.   **(07 Marks)**
   c. Find the volume of the parallelopiped whose co-terminal edges are represented by the vectors,
       $$\vec{a} = \hat{i} + \hat{j} + \hat{k}, \quad \vec{b} = 2\hat{i} + 3\hat{j} - \hat{k} \quad \text{and} \quad \vec{c} = \hat{i} - \hat{j} - \hat{k}$$ **(06 Marks)**

4 a. Find the velocity and acceleration of a particle moves along the curve $\vec{r} = e^{-2t}\hat{i} + 2\cos 5t\hat{j} + 5\sin 2t\hat{k}$ at any time 't'.   **(07 Marks)**
   b. Find the directional derivative of x^2yz^3 at (1, 1, 1) in the direction of $\hat{i} + \hat{j} + 2\hat{k}$.   **(07 Marks)**
   c. Find the divergence of the vector $\vec{F} = (xyz + y^2z)\hat{i} + (3x^2 + y^2z)\hat{j} + (xz^2 - y^2z)\hat{k}$.   **(06 Marks)**

5 a. $\vec{F} = (x + y + 1)\hat{i} + \hat{j} - (x + y)\hat{k}$, show that $\vec{F} \cdot \text{curl}\,\vec{F} = 0$.   **(07 Marks)**
   b. Show that the vector field, $\vec{F} = (3x + 3y + 4z)\hat{i} + (x - 2y + 3z)\hat{j} + (3x + 2y - z)\hat{k}$ is solenoidal.   **(07 Marks)**
   c. Find the constants a, b, c such that the vector field,
       $\vec{F} = (x + y + az)\hat{i} + (x + cy + 2z)\hat{j} + (bx + 2y - z)\hat{k}$ is irrotational.   **(06 Marks)**

6   a.   Prove that $L(\sin at) = \dfrac{a}{s^2 + a^2}$.   **(07 Marks)**

b.   Find $L[\sin t \; \sin 2t \; \sin 3t]$.   **(07 Marks)**

c.   Find $L[\cos^3 t]$.   **(06 Marks)**

7   a.   Find the inverse Laplace transform of $\dfrac{1}{(s+1)(s+2)(s+3)}$.   **(07 Marks)**

b.   Find $L^{-1}\left[\log\left(1 + \dfrac{a^2}{s^2}\right)\right]$.   **(07 Marks)**

c.   Find $L^{-1}\left[\dfrac{s+2}{s^2 - 4s + 13}\right]$.   **(06 Marks)**

8   a.   Solve the differential equation, $y'' + 2y' + y = 6te^{-t}$ under the conditions $y(0) = 0 = y'(0)$ by Laplace transform techniques.   **(10 Marks)**

b.   Solve the differential equation, $y'' - 3y' + 2y = 0 \;\; y(0) = 0, \;\; y'(0) = 1$ by Laplace transform techniques.   **(10 Marks)**

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10CS42

Fourth Semester B.E. Degree Examination, June/July 2016
Graph Theory & Combinatorics

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. Define : i) Complete Bipartite Graph   ii) Regular Graph and   iii) Induced Subgraph.
   Give one example for each. **(06 Marks)**

   b. For a graph with n vertices and m edges, if δ is minimum and Δ is maximum of the degrees
   of vertices show that $\delta \leq (2m/n) \leq \Delta$. **(05 Marks)**

   c. Show that the following graph is isomorphic to Kuratowski's second Graph ($K_{3.3}$) **(05 Marks)**

   Fig Q1(c)
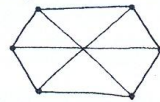
   d. Write a note on Konigsberg's seven Bridge problems. **(04 Marks)**

2 a. Prove that a connected planar graph G with n vertices and m edges has exactly
   $(m - n + 2)$ regions in every one of its diagrams. **(07 Marks)**

   b. State and explain Kuratowski's theorem. Show that the graphs K_5 and $K_{3.3}$ are non-planar by
   re-drawing them. **(06 Marks)**

   c. Find the chromatic polynomial for the following graph. If 5 colors are available, in how
   many ways can the vertices of this graph be properly colored? **(07 Marks)**

   Fig Q2(c)

3 a. Define Trees. Prove that a tree with n – vertices has n-1 edges. **(06 Marks)**

   b. Define: i) Spanning Tree   ii) Rooted Tree and   iii) Full Binary Tree.
   Give one example for each. **(06 Marks)**

   c. Explain prefix codes. Obtain an optimal prefix code for the message MISSION
   SUCCESSFUL. Indicate the code for the message. **(08 Marks)**

4 a. Explain the steps in Dijkstra's shortest path algorithm. **(06 Marks)**

   b. Using Prim's algorithm, find a minimal spanning tree for the weighted graph shown below.
   (07 Marks)

   Fig Q4(b)
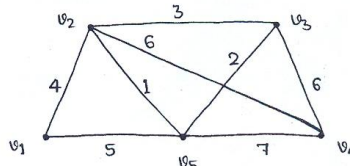
   c. Three boys B_1, B_2, B_3 and four girls G_1, G_2, G_3, G_4 are such that i) B_1 is a cousin of G_1, G_3, G_4
   ii) B_2 is a cousin of G_2 and G_4 iii) B_3 is a cousin of G_2 and G_3.
   If boys must marry a cousin girl, find the possible sets of such couples. **(07 Marks)**

PART – B

5 a. i) How many arrangements are there for all letters in the word SOCIOLOGICAL?
       ii) In how many of these arrangements
          • A and G are adjacent?
          • All the vowels are adjacent?   (06 Marks)
   b. Find the co-efficient of
       i) $x^9 y^3$ in the expansion of $(2x - 3y)^{12}$.
       ii) $a^2 b^3 c^2 d^5$ in the expansion of $(a + 2b - 3c + 2d + 5)^{16}$ (06 Marks)
   c. In how many ways can one distribute eight identical balls into four distinct containers so that
       i) no container is left empty?   ii) the fourth container gets an odd number of balls?
                                                                                 (08 Marks)

6 a. State and prove the principle of Inclusion – Exclusion for n sets.   (05 Marks)
   b. In how many ways can the 26 letters of the English alphabet be permuted so that none of the
       patterns CAR, DOG, PIN, and BYTE occurs?   (05 Marks)
   c. In how many ways can the integers 1, 2, 3, ----- 10 be arranged in a line so that no even
       integer is in its natural place?   (05 Marks)
   d. An apple, a banana, a mango, and an orange are to be distributed to four boys B_1, B_2, B_3, B_4.
       The boys B_1 and B_2 do not wish to have apple, the boy B_3 does not want banana or mango,
       and B_4 refuses orange. In how many ways the distribution can be made so that no boy is
       displeased?   (05 Marks)

7 a. Using the generating functions, find the number of i) non negative, and ii) positive, integer
       solutions of the equation $x_1 + x_2 + x_3 + x_4 = 25$.   (06 Marks)
   b. A bag contains a large number of red, green, white and black marbles, with atleast 24 of
       each colour. In how many ways can one select 24 of these marbles, so that there are even
       number of white marbles and atleast six black marbles.   (07 Marks)
   c. Using exponential generating function, find the number of ways in which four of the letters
       in the word ENGINE be arranged.   (07 Marks)

8 a. Solve the recurrence relation.
       $a_n = 2a_{n/2} + (n - 1)$ for $n = 2^k, k \geq 1$, given $a_1 = 0$.   (08 Marks)
   b. The number of virus affected files in a system is 1000 (to start with) and this increases
       250% every two hours. Using a recurrence relation determine the number of virus affected
       files in the system after one day.   (05 Marks)
   c. Find and solve a recurrence relation for the number of binary sequences of length $n \geq 1$ that
       have no consecutive O's.   (07 Marks)

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Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. Define big oh, omega and theta notations' for analyzing algorithm. Give at least one example for each. **(10 Marks)**
   b. Write a algorithm for selection sort in ascending order. Show that its complexity is $O(n^2)$ and sort the following list 65, 50, 21, 43, 10, 15. **(06 Marks)**
   c. Write the algorithm for sequential search, obtain the time complexity of this algorithm for successful and unsuccessful search in the worst case and best case. **(04 Marks)**

2 a. Explain the concept of divide and conquer. Design an algorithm for merge sort and derive time complexity. **(10 Marks)**
   b. Write a algorithm for Quick sort, and sort the following number's 10, 8, 5, 15, 25, 75, 12. Obtain its time complexity. **(10 Marks)**

3 a. Obtain the optimal solution for the job sequencing problem with deadline, where n = 4 profit $(P_1, P_2, P_3, P_4) = (100, 10, 15, 27)$ and dead lines $(d_1, d_2, d_3, d_4) = (2, 1, 2, 1)$. **(04 Marks)**
   b. Explain the concepts of greedy technique for prim's algorithm. Obtain minimum cost spanning tree for the graph whose weight matrix is given below

$$\begin{bmatrix} 0 & 3 & \infty & 7 & \infty \\ 3 & 0 & 4 & 2 & \infty \\ \infty & 4 & 0 & 5 & 6 \\ 7 & 2 & 5 & 0 & 4 \\ \infty & \infty & 6 & 4 & 0 \end{bmatrix}$$

(08 Marks)

   c. Write a Kruskal algorithm to find minimum cost spanning tree and obtain spanning tree of the graph shown below: **(08 Marks)**
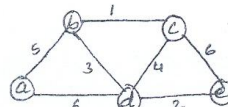

Fig Q3(c)

4 a. Write Floyd's algorithm and solve the all pair shortest path problem for the graph shown below : **(10 Marks)**
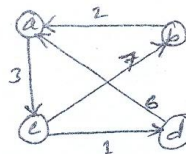

Fig. Q4(a)

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b. Write a algorithm for knapsack problem for dynamic programming and solve the following instance of the knapsack problem,
n = 4, weights $(w_1, w_2, w_3, w_4) = (2, 1, 3, 2)$, profit $(p_1, p_2, p_3, p_4) = (12, 10, 20, 15)$
Capacity W = 5. (10 Marks)

PART – B

5 a. Explain the concept of decrease and conquer method, indicating the three major variations of the same with examples. (06 Marks)
b. Write insertion sort algorithm and obtain its time complexity. Apply insertion sort on these elements: 25, 75, 40, 10, 20. (08 Marks)
c. Write a algorithm to sort by counting method. Obtain its time complexity, sort by count for given data 25, 45, 10, 20, 50, 15. (06 Marks)

6 a. Explain the lower bound and trivial lower bound arguments (08 Marks)
b. What is a decision tree? Obtain decision tree to find minimum of three numbers. (06 Marks)
c. Explain the P, NP and NP complete problems. (06 Marks)

7 a. What is a N-Queen's problem? Give the state space tree for solving 4 Queen problem for at least one solution? (06 Marks)
b. With help of a state space tree solve the following instance of the knapsack problem by the branch and bound algorithm
N = 4 weight $(w_1, w_2, w_3, w_4) = (4, 7, 5, 3)$
Profit $(p_1, p_2, p_3, p_4) = (40, 42, 25, 12)$
W = 10 capacity of knapsack. (06 Marks)
c. Obtain the optimal solution for the given assignment problem as a matrix shown below using branch and bound method :

Jobs

	J_1	J_2	J_3	J_4
a	9	2	7	8
b	6	4	3	7
c	5	8	1	8
d	7	6	9	4

person

(08 Marks)

8 a. What is a prefix computation problem? Give the algorithm for prefix computation which use
i) n – processor   ii) n/log n (06 Marks)
b. Explain the different types of computational models. (08 Marks)
c. Obtain the maximum speed up when P = 10 and for various value of f = (0.5, 0.1, 0.01). (06 Marks)

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Fourth Semester B.E. Degree Examination, June/July 2016
UNIX and Shell Programming

Time: 3 hrs.   Max. Marks:100

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

PART – A

1   a.   With neat diagram, explain architecture of UNIX operating system.   **(06 Marks)**
    b.   With the help of examples, explain the following commands :
         i) apropos   ii) whatis   **(06 Marks)**
    c.   Explain the following with suitable examples :
         i)   absolute and relative pathnames
         ii) internal and external commands.   **(08 Marks)**

2   a.   Files current permissions are rw – – w – r – – write chmod expressions required to change
         them for the following :
         i)   r – – r – – – – x
         ii)   r w x r w x – – x
         iii) r – x r – x r – x
         iv)   r w x r w x r – –
         using both relative and absolute methods of assigning permissions.   **(08 Marks)**
    b.   What are different modes of vi editor? Explain with a neat diagram.   **(06 Marks)**
    c.   Write UNIX commands for the following :
         i)   Find and replace all the occurrences of unix with UNIX in the text file after confirming
              the user (vi editor command).
         ii) List all the files in PWD which are having exactly five characters in their filename and
              any number of characters in their extension
         iii) To copy all files stored in /home/vtu with ·c, ·cpp and ·java extensions to progs
              directory in current directory
         iv) To delete all files containing * in their file name
         v)   To delete all files with three character extension except ·out from current directory
         vi) To display (list) contents of current directory and its subdirectories.   **(06 Marks)**

3   a.   Explain 3 standard files supported by UNIX. Also give details about special files used for
         output redirection in UNIX.   **(08 Marks)**
    b.   Explain mechanism of process creation. Also given details about process states and
         zombies.   **(08 Marks)**
    c.   Explain following with examples :
         i) cron   ii) HOME   iii) PATH   iv) MAIL.   **(04 Marks)**

4   a.   i) Differentiate between hard link and symbolic link
         ii) Explain significance of permissions to directory.   **(08 Marks)**
    b.   What does touch foo command mean? Why touch command is important for the system
         administrator?   **(06 Marks)**
    c.   Explain the following with example :
         i) head   ii) tail   iii) cut.   **(06 Marks)**

PART - B

5   a.   With the help of example explain grep command and list its options with their significance.
                                                                                      (08 Marks)
    b.   Explain line addressing and context addressing in sed with example.   **(06 Marks)**
    c.   Briefly explain interval regular expression and tagged regular expression. **(06 Marks)**

6   a.   Explain shell features of while and for with syntax.   **(08 Marks)**
    b.   What is exit status of a command and where it is stored? And how it can be accessed? Give
         examples.   **(06 Marks)**
    c.   Write a shell code to accept a string from the terminal and display suitable message if it
         doesn't have at least 10 characters using : i) case ii) expr.   **(06 Marks)**

7   a.   What is AWK? Explain any three built in functions of AWK.   **(08 Marks)**
    b.   What are associative arrays? How they are implemented in AWK?   **(06 Marks)**
    c.   With syntax and examples, explain control flow statements in AWK.   **(06 Marks)**

8   a.   Explain any three string handling functions in Perl.   **(06 Marks)**
    b.   With suitable examples explain split and join functions in Perl.   **(06 Marks)**
    c.   Write a Perl program that prompts the user to input string and a number and prints the string
         those many times on different lines to standard output.   **(08 Marks)**

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Fourth Semester B.E. Degree Examination, June/July 2016
Microprocessors

Time: 3 hrs.   Max. Marks:100

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

PART – A

1   a.   What is a microprocessor? Explain how data, address and control busses interconnect various system components.   **(05 Marks)**

    b.   Explain in detail with a neat diagram, the working of the internal architecture of the 8086 microprocessor.   **(10 Marks)**

    c.   Giving the format of the 8086 microprocessor's flag register, explain in detail each flag bit.   **(05 Marks)**

2   a.   Explain the following addressing modes with examples :
      i) Direct addressing
      ii) Immediate addressing
      iii) Register indirect addressing
      iv) Base plus index addressing
      v) Base relative plus index addressing.   **(10 Marks)**

    b.   Explain how virtual address is translated into physical address in 8086 microprocessor. Given :CS = 2000h, DS = 4000h, ES = 6000h, SS = 8000h, BX = 300h, BP = 200h, SI = 100h and LIST = 0014h
Find the physical address for the following :
      i) MOV DL, LIST[SI]
      ii) MOV AL, LIST[BX] [SI]
      iii) MOV AH, CS : [BX]
      iv) MOV CL, 23h [BP].   **(06 Marks)**

    c.   Explain the working of PUSH and POP instructions indicating the state of the stack after the execution of the instructions.   **(04 Marks)**

3   a.   Giving the general machine language instruction format of a MOV instruction, generate the machine code for the following instructions :
      i) MOV DL, [DI]
      ii) MOV [1000H], DL
      iii) MOV [BP], DL
      iv) MOV WORD PTR [BX + 1000H], 1234H.   **(10 Marks)**

    b.   Write an ALP to sort five 8–bit numbers stored in an array in descending order using bubble sort algorithm.   **(06 Marks)**

    c.   Explain the working of XLAT instruction, illustrate its importance using a suitable program.   **(04 Marks)**

4   a.   Explain the following instructions with examples :
i) DAA   ii) RLC   iii) AAM   iv) MOVSB.   **(08 Marks)**

    b.   Write an ALP using 8086 instruction set to count the number of ones in a given 8 – bit number and store the result at a memory location.   **(07 Marks)**

    c.   What is a procedure? Explain the sequence of operations that take place when a procedure is CALLed and RETurned.   **(05 Marks)**

PART – B

5 a. Differentiate between :
   i) Assembler and linker
   ii) PUBLIC and EXTERN
   iii) Macros and procedures. **(06 Marks)**

   b. What are modular programs? Explain. Using the PUBLIC and EXTERN directives write a program in assembly language that reads a string into an array in one module and converts the string to uppercase in another module. **(08 Marks)**

   c. What is recursion? Explain. Write an ALP to find the factorial of a single digit positive number using recursive procedure. **(06 Marks)**

6 a. Explain the significance of the following pins of an 8086 microprocessor :
   i) READY   ii) $\overline{\text{TEST}}$ iii) ALE   iv) HOLD. **(04 Marks)**

   b. With neat timing diagrams explain read bus cycle and write bus cycle. **(08 Marks)**

   c. With a neat diagram, explain the minimum mode configuration of 8088 microprocessor based computing system. **(08 Marks)**

7 a. Differentiate between memory mapped IO and IO mapped IO. **(04 Marks)**

   b. What is address decoding? Why is it required? Explain how a 3 – 8 line decoder could be used to interface 64K memory using 8K memory chips. **(08 Marks)**

   c. Design a memory system to interface $8 \times 8K$ EPROM and $8 \times 4K$ SRAM to 8088 microprocessor. Assuming SRAM memory starts from 00000H and EPROM from E0000h. **(08 Marks)**

8 a. Explain the control word format of 8255 PPI in IO mode and BSR mode. Construct control words for the following :
   i) Port A input, PORT B output and PORT C output ports
   ii) PORT A bi-directional mode, PORT B output port
   iii) Set PC1 and reset PC5. **(08 Marks)**

   b. With a neat block schematic diagram explain the internal architecture of 8254 PIT. **(08 Marks)**

   c. What is DMA? Why is it required? Explain the basic DMA operation. **(04 Marks)**

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Fourth Semester B.E. Degree Examination, June/July 2016
Computer Organization

Time: 3 hrs.   Max. Marks:100

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

PART – A

1   a. List the steps needed to execute the machine instruction given below in terms of transfers between the components of processor, memory and some control commands. ADD LOCA, R0. Assume the instruction is stored in memory location 'INSTR'.   **(05 Marks)**
    b. Perform the following operations on the 5-bit signed numbers using 2's complement representation system. Further indicate whether overflow has occurred.
        i) (-10) + (-13)   ii) (-10) – (+4)   iii) (+7) – (-15)   iv) (+8) + (+10).   **(10 Marks)**
    c. Write the basic performance equation. Explain the role of each of the parameters in the equation on the performance of the computer.   **(05 Marks)**

2   a. Define addressing mode and explain any four addressing modes with an example for each.   **(09 Marks)**
    b. What is subroutine linkage? With examples explain different ways of passing parameters to subroutine.   **(06 Marks)**
    c. Explain in detail encoding of machine instructions into 32-bit words. Assume that there are 16 registers in the processor.   **(05 Marks)**

3   a. Define interrupt. What are the overheads incurred in handling interrupts?   **(04 Marks)**
    b. With neat sketches explain a method for handling interrupts from multiple devices.   **(10 Marks)**
    c. What is bus arbitration? With a neat diagram, explain any one approach used for bus arbitration.   **(06 Marks)**

4   a. With a block diagram, explain a general 8-bit parallel interface.   **(10 Marks)**
    b. List out widely used bus standards in a computer system. Further, explain the READ operation using PCI bus with a timing diagram.   **(10 Marks)**

PART – B

5   a. What is a cache? Explain any two cache mapping functions with neat sketches.   **(10 Marks)**
    b. What is a virtual memory? With a neat diagram, explain the method for translating virtual address to physical address.   **(10 Marks)**

6   a. Explain the design of a 4-bit carry-look ahead adder.   **(08 Marks)**
    b. Multiply (+14) and (-6) using Booth's algorithm.   **(07 Marks)**
    c. Perform the division of number 8 by 3 (8 ÷ 3) using restoring division method.   **(05 Marks)**

7   a. Write the sequence of control steps to execute the instruction, ADD (R_3), R_1 on single bus architecture.   **(07 Marks)**
    b. With a block diagram, describe the organization of a micro programmed control unit.   **(10 Marks)**
    c. Bring out the differences between micro programmed control and Hard-Wired control.   **(03 Marks)**

8   a. Explain any two shared memory multiprocessor models.   **(10 Marks)**
    b. Briefly explain SISD and SIMD architectures with neat diagrams.   **(10 Marks)**

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