Student Exam No: _____

Ganpat University
B.Tech SEM. IV MECHANICAL ENGINEERING
REGULAR EXAMINATION May-June 2013
2ME405 Numerical Methods and Computer Programming

TIME: - 3 hrs.   Total Marks: - 70

INSTRUCTIONS:-
1. All questions are compulsory.
2. Write your answer to the point and draw neat sketch or figure.
3. Figures to the right indicate the full marks of questions.

SECTION - I

Q.1 (a) What are the disadvantages of structural programming over OOP? Explain. [05]

   (b) Explain any two manipulators in C++ with an example. [04]

   (c) Explain following : [03]
       (i)   private
       (ii)   protected
       (iii)   register storage class

OR

Q.1 (a) Write a procedural C++ program to find the sum of following series: [05]

$$sum = 1 + \frac{x^2}{2!} + \frac{x^4}{4!} + \frac{x^6}{6!} + ... \frac{x^{2n}}{2n!}$$

   (b) Explain the concept of data hiding and Data encapsulation in OOP. [04]

   (c) What is function of scope resolution operator in OOP? Give sample code in C++ language. [03]

Q.2 (a) Explain the default argument function. [05]

   (b) Explain a concept of friend function and friend class with one sample C++ program. [06]

OR

Q.2 (a) Explain the concept of constructor and destructor. [05]

   (b) Create a complex class that stores the real and imaginary value of two variables. Overload the + operator so that the user can add two variables and display on screen. [06]

Q.3 (a) Write an OOP to concate two strings with constructor. [06]

   (b) What is the importance of private and public keyword in inheritance concept? If inheritance type for class is changed to protected, what changes would be done during accessing data members and its effect on further inheritance process. [06]

SECTION - II

Q.4 (a) A matrix is given below [04]

$$A = \begin{bmatrix} 4 & 1 & 6 \\ 1 & 3 & 1 \\ 5 & 2 & 5 \end{bmatrix}; \quad b = \begin{Bmatrix} 20 \\ 10 \\ 24 \end{Bmatrix};$$

Apply the Gauss Jordan method and solve the equation$[A]\{X\} = \{b\}$.

(b) A boy flying the kite, the thread of a kite which follow the **[04]** curve $e^x - 1$, x represents the horizontal distance from a boy to projection point of kite. For the different values of x= 0, 1, 2, 3 consider the height of the points of thread. Use Lagrange polynomial and find the height of thread point at the distance of x=2.5.

(c) Solve the Leonardo equation **[04]**
$$f(x) = x^3 - x - 2 = 0$$
by Muller's method. Assume three starting points $x_1 = 1, x_2 = 1.2, x_3 = 1.4$. Only two iterations processed

OR

Q.4 (a) Find correct to 5 decimal places, the x coordinate of the point on the **[08]** curve $y = \ln x$ which is closest to the origine. Use Newton Method.

(b) The points A(0,-1), B(2,113), C(3,381), D(5,1754), E(6,3029), F(-1,-16) represent the path of a bird in 2D plane create in sky. Use Newton **[04]** Divided Difference formula and find the coordinates of bird if its x coordinate is 4.

Q.5 (a) $$f(x) = 0.2 + 25x - 200x^2 + 675x^3 - 900x^4 + 400x^5$$ **[05]**
Use Simpson's 1/3 rules to integrate the above function for five segments from a=0 to b=0.8.

(b) Use the Taylor Method recursively to solve the equation **[06]**
$$y' = x^2 + y^2, \quad y(0) = 0$$
For the interval (0, 0.4) using two subintervals of size 0.2.

OR

Q.5 (a) The number of cell phones (in millions) owned by the residents of a **[05]** city is given by the equation $\frac{dx}{dt} = ye^t; \; y(0) = 1$. Where t is the time in year from 2008. Use Euler's method with four equal steps to estimate the number of cell phones owned in the year 2010.

(b) Find the integral using Simpson's 1/3 rule **[06]**

(i) $\int_{-1}^{1} e^x \, dx$

(ii) $\int_{0}^{\pi} \sqrt{\sin x} \, dx$

Q.6 (a) Find the Fourier cosine series for $f(x) = x^3$ on $0 \leq x \leq L$ **[06]**

(b) Solve the following BVP **[06]**
$$y'' + 9y = \sin x \qquad y'(0) = 5 \qquad y\left(\frac{\pi}{2}\right) = -\frac{5}{3}$$

END OF PAPER