BACHELOR OF ENGINEERING IN PRODUCTION ENGINEERING EXAMINATION, 2017

(2nd Year, 1st Semester, Supplementary)

COMPUTER PROGRAMMING & NUMERICAL ANALYSIS (OLD)

Time : Three hours Full Marks : 100

Answer any ***five*** questions

1. a) Write a C program to convert Fahrenheit (f) temperature values from 0°F to 250°F, increasing in steps of 5, into equivalent Centigrade(c) values, using the following formula.

$$C = (f-32)/1.8$$

Display the output in tabular form, in which the first column has a heading FAREN and second column has a heading CENT.

b) Write a C program to read a list on ***n*** integers in an array and display the largest number in the list. The value of ***n*** will be provided as input by the user before the list of integers are supplied.

10 + 10 marks

2. a) Write a C program to read the values of the coefficients ***a,b,c*** of a quadratic equation of the form $ax^2+bx+c=0$ and check if the equation has imaginary roots or real roots and then display the roots. For imaginary roots, display the real and imaginary parts of each root as a pair like (real part, imaginary part).

b) Write a C program to read the scores of 30 students of a class with student code from 0 to 29 in five subjects with subject code from 0 to 4 and display the total score of each student shown against his/her student code.

10 + 10 marks

3. a) Write a user-defined function in C to calculate the factorial of any positive integer ***n***. Using the function, write a complete C program to display the factorials of the numbers {0,1,2,3,4,5,6,7} in a tabular form, in which the first column heading is ***NUMBER*** and the second column heading is ***FACTORIAL***.

b) Write a C program to find the root of a function using bisection method, correct up to 4 decimal places. Take $f(x) = x^3 - 3$ in the interval [1, 2].

(4 + 6) + 10 marks

4. a) Using Trapezoidal rule, find $\int_0^1 \sqrt{x^2 + 1}\, dx$. Use a step-size of 0.2. Solve the same problem using Simpson's 1/3rd Rule.

b) Solve the following using Gaussian Elimination Method

$y + z = 2$

$2x + 3z = 5$

$x + y + z = 3$

(4+6) + 10 marks

5. a) Find a root of $f(x) = 3x + \sin(x) - \exp(x) = 0$ using Bisection Method in [0, 0.5]. Perform the operation for up to 4 iterations.

b) Illustrate the Euler's Method for solving Ordinary Differential Equations.

c) Find y(0.1) for $\frac{dy}{dx} = x - y^2$, $y(0) = 1$. Take h=0.025.

8 + 4 + 8 marks

(Contd. 2)

6. a) Derive the Newton-Raphson formula for finding roots of equations. Illustrate it graphically.

b) Find the root of the following equation in interval [1,2] using the formula derived in Q. 6(a).

$$2x^3 - 2.5x - 5 = 0$$

Show the process for 4 iterations.

c) Consider an equation

$$x^4 - x - 10 = 0$$

Find a root of the equation using the fixed point iterative scheme.

Take g(x) = $(x+10)^{1/4}$ and initial guess x_0=4.0. Continue the process for 5 iterations.

5+7+8 marks