SULIT

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2011/2012

COURSE NAME	:	COMPUTER PROGRAMMING
COURSE CODE	:	BDU 10103
PROGRAM	:	BDC AND BDM
EXAMINATION DATE	:	JANUARY 2012
DURATION	:	3 JAM
INSTRUCTION	:	*ANSWER THREE QUATIONS OF PART A AND ONE (1) OUT OF TWO (2) QUESTIONS FOR PART B.*

THIS PAPER CONTAINS FIVE (5) PRINTED PAGES

SULIT

PART A : Answer all three problems.

Q1 a. Computer can be classified according to their size and power or their function. Explain briefly four type of computer defined according to their size and power?.
b. What is the differences between computer memory and computer data storage.
c. What is difference between static RAM and dynamic RAM.

(20 Marks)

Q2 Write in the form of FORTRAN expression for the following mathematical equations as given belows :

a. $$y = \frac{x-4}{x^2+1} + \frac{2}{5}x$$

b. $$y_i = \frac{\frac{2}{3}x_i^2 + 4x_i + 1}{|x_i - 1|}$$

c. $$y = 3\sin^2 x + 4\cos x^3 + tg\,(2x)$$

d. $$y = \ln(2x^2 + 4x + 1) + x^2$$

e. $$y = \begin{cases} x^2 + 4x + 3 & -3 \le x < 1 \\ Log_{10}(x+1) & 1 \le x < 4 \\ \frac{1}{\sqrt{x^3+1}} & 4 \le x \le 10 \end{cases}$$

(20 Marks)

Q3 Given a function sin (x) in the form of Maclaurin series as :

$$y = \sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots - \ldots + \frac{x^{N-1}}{(N-1)!} - \frac{x^N}{N!} \qquad \text{x in radian.}$$

$$N! = 1 \times 2 \times 3 \times \ldots \times (N-1) \times N$$

Here one has to develop a computer code which allow to obtain the value y for any given value of Maclaurin order N as well as the of independent variable x which given in degree. The computer code will produce result which appears on the monitor screen as follows:

5-blank-Maclaurin Series of sin(x)
5-blank-Maclaurin order N = ...
5-blank- Given x value (deg) = ...
5-blank- Result Maclaurin series y = ...
5-blank- Computer result y_c = ...
5-blank- Percentage difference (y-y_c)/y_c (%) = ...

The format output for any Integer variable will be assigned with I5 while for real variable with F10.4.

Write the flow chart and computer code

(20 Marks)

Part B : Select one out of two questions

Q4. If one has to carry out interpolation over an array of data set. One can use a Lagrange Interpolation method. This method can be written mathematically as:

$$\mathbf{y(x) = y_1 + \frac{x - x_1}{x_2 - x_1}(y_2 - y_1) \quad for \ x_1 < x < x_2}$$

$$\mathbf{y(x) = y_{N-1} + \frac{x - x_{N-1}}{x_N - x_{N-1}}(y_N - y_{N-1}) \quad for \ x_{N-1} < x < x_N}$$

$$\mathbf{y(x) = \frac{(x - x_i)(x - x_{i+1})}{(x_i - x_{i-1})(x_{i+1} - x_{i-1})} y_{i-1} + \frac{(x - x_{i-1})(x - x_{i+1})}{(x_{i-1} - x_i)(x_{i+1} - x_i)} y_i \ +}$$
$$\mathbf{+ \frac{(x - x_{i-1})(x - x_i)}{(x_{i-1} - x_{i+1})(x_i - x_{i+1})} y_{i+1} \quad for \ x_{i-1} < x < x_i,}$$
$$\mathbf{i = 2, 3, 4, ..., N-1}$$

Suppose in file : XYDATA.dat, one has an array data which consists of 41 pair of $\left(\mathbf{X}, \mathbf{Y}_1(\mathbf{X})\right)$ and $\left(\mathbf{X}, \mathbf{Y}_2(\mathbf{X})\right)$ as given in the Table Q4.

```
41
*********************************
XDT          YDT1         YDT2
*********************************
0.0          3.2421       1.2423
0.25         1.2571       2.1111
0.50         2.4671       6.7184
0.75         1.4271       8.7185
1.00         5.7672       9.7174
1.25         8.4674       11.7189
```

1.50	1.4691	12.6185
---	-----	-----
---	-----	-----
5.00	11.4271	28.3187
5.25	15.7672	39.2174
5.50	18.4674	21.4189
5.75	21.4691	18.5186
---	-----	-----
---	-----	-----
9.00	41.4271	38.3127
9.25	31.4271	28.2287
9.50	25.7672	29.2571
9.75	18.4674	24.4189
10.00	11.4691	12.5187

TABLE Q4 : DATA X,Y1 and Y2

The features of the developed computer will be

(i) Read data file through key in its file name.
(ii) User key in for any value of x
(i) The computer code will call SUBROUTINE INTERPOL twice, as follows: call this subroutine as :
CALL INTERPOL (XDT,YDT1,NP, X, Y1) and then
CALL INTERPOL (XDT,YDT2,NP, X, Y2)
(ii) The result will be presented in the screen of monitor in the form :
5 blank : At given XP = -------.---
5 blank Interpolated value Y1 = -------.---
5 blank Interpolated value Y2 = -------.---

Write the flow chart and computer code for this problem

(40 marks)

S5 Given an ordinary differential equation as:

$$\frac{\mathbf{dy}}{\mathbf{dx}} = f(x,y) = x^2y + 4x + 5e^{-0.1x} + 3.0$$

Initial condition is given as:

$$x = x_0 \qquad y = y_0$$

The numerical method for solving ordinary differential equation may one uses the Fourth order Runge Kutta method defined as:

$$y_{i+1} = y_i + \frac{dx}{6}(\mathbf{m}_1 + 2\mathbf{m}_2 + 2\mathbf{m}_3 + \mathbf{m}_4), \quad i = 0,1,2, ..., N$$

Where :

$$m_1 = f(x_i, y_i)$$

$$m_2 = f\left(x_i + \frac{dx}{2}, y_i + m_1 \frac{dx}{2}\right)$$

$$m_3 = f\left(x_i + \frac{dx}{2}, y_i + m_2 \frac{dx}{2}\right)$$

$$m_4 = f(x_i + dx, y_i + m_3\, dx)$$

The feature of computer code :

- The initial value x_0 and y_0 are given through key in
- The value of x_N and step number N are key in
- The function of f(x,y) is placed as sub function
- The computer code will produce the result which is appearing on screen and also save in File. File name for output is is key in by the user.
- The result will looks like as bellow:

  5-blank- Fourth Order Runge Kutta Method
  5-blank- Initial value : X0 = ... Y0 = ...
  5-blank – Interval step dx = ...
  5-blank- **********************************
  5-blank- No x-pos y
  5-blank-**********************************

1	0.5000	2.4122
2	0.6000	2.9123
......	....	....
....	....	....
N	F9.4	F9.4

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Write the flow chart and computer code.

(40 marks)