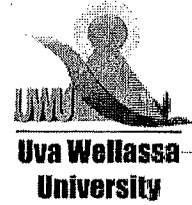


Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
200 Level 2nd Semester Examination – Dec./Jan. 2016/17
SCT 202-3 Differential Equations and Applications



Instructions to candidates

Duration: One (01) hour and Thirty (30) minutes

Number of questions: Four (04) Questions

Mark allocation: 60 mark

Create a folder on **Desktop** and rename with your **Index Number** (i.e. UWU_EX_14_0XXX).

Create the separate files for each question inside the folder.

Zip your folder, then upload to the **CMS**.

Use software package **MATLAB R2015b**.

Removable storage devices and mobile phones are strictly prohibited.

You are not allowed to use internet facility during the examination.

Save your works continuously.

Answer THREE (03) questions ONLY.

PART B

1.

a. Open a new M-file and write an attractive MATLAB program to achieve the followings. Save this program as **q1a.m**.

i. Create the following matrix **A** by entering its elements as a sequence.

$$A = \begin{pmatrix} 2 & 7 & 3 \\ 5 & 5 & 4 \\ 8 & -1 & 6 \end{pmatrix}$$

ii. Create the following **matrix B** by reading from separate text file (save matrix **B** as **B.txt**). *Load this external file (B.txt) into the original M-file.*

$$B = \begin{pmatrix} -2 & 0 & 5 \\ 9 & 4 & 7 \\ 6 & 5 & 6 \end{pmatrix}$$

- iii. Create 3*3 **matrix C** by using *rand* function.
- iv. Add **A** and **C**, and name it as **D**.
- v. Multiply **A** and **B**, and name it as **E**.
- vi. Find the determinant of matrix **A**.
- vii. Find the inverse of matrix **B**.
- viii. Find the transpose of matrix **C**.
- ix. Display the concatenation of matrix **A** and **B**, and name it as **F**.
- x. Determine matrix **G**, where $G = A^2 - 3B + C$.



(10 mark)

b. Mr. Perera, Mr. Zoysa and Ms. Amanda went to McDonalds to get their breakfast. Mr. Perera took a cheeseburger, two sausage biscuits and three hotcakes totaling 660 calories. Mr. Zoysa took two cheeseburgers, a sausage biscuit and two hotcakes totaling 780 calories. Ms. Amanda took a cheeseburger, three sausage biscuits and a hotcake totaling 540 calories. You are required to create a system of linear equations which is displaying amount of calories for each type of foods.

- i. Write a system of linear equations that describes the above situation (Use the provided answer booklet to write it).
- ii. Open a new M-file and develop a MATLAB program to solve the system of linear equations. Save this program as **q1b.m**.
- iii. How many calories are in each type of foods separately? (Run the program *q1b.m* and write the solutions in the provided answer booklet.)

(10 mark)

2. The Body Mass Index (BMI), for a person is defined, using SI units, as

$$\text{BMI} = \frac{\text{MASS}}{(\text{HEIGHT})^2};$$

where the mass is in kilograms (kg) and the height is in meters (m).

- a. Open a new M-file and write a *user-defined function* that would receive the mass and height as input arguments and, would return the BMI. Save this *function* and *function file* as **bmi.m**.
- b. Open a new M-file to compute results for MASS = 60kg and Height = 2m. Save this file as **q2b.m**. (Run this program and write the answer in the provided answer booklet.)
- c. Open a new M-file and write a program to prompt the user for his/her mass and height. Display your output by using *display/fprintf* commands. Save this file as **q2c.m**.

(20 mark)

3. In Uva Wellassa University of Sri Lanka, overall GPA of the students will be calculated by the Examination Division of the university. GPA is calculated to the second decimal point. The following table is included the minimum requirements of GPA to obtain the classes (honors degree) or general pass in a respective degree program.

Class	Minimum Requirements of GPA
First class honors	GPA >= 3.70
Second class – upper division honors	GPA >= 3.30
Second class – lower division honors	GPA >= 3.00
General pass	GPA >= 2.00
Not qualified to be a graduate	GPA <= 1.99

Open a new M-file and write an attractive MATLAB program to implement the given scenario. Finally, display the status of academic performance of a particular student as output. Save this program as **q3.m**.

(Hint: Prompt the user for a GPA by using *input* command and print the output by using *display* command)

For example, the output might look like this:

Examination Division – Uva Wellassa University of Sri Lanka

Enter your overall GPA: X.XX

Status of your performance: XXXXXXXXXXXX

(20 mark)

4.

- a. Write a MATLAB program that will print a list of cylinder, cone, and sphere. It prompts the user for the appropriate quantities (e.g. the radius of sphere) and then prints its volume. Open a new M-file and save it as **q4a.m**. Here is an example of running it (units are assumed to be inches).

Menu
Cylinder – 1
Cone – 2
Sphere – 3

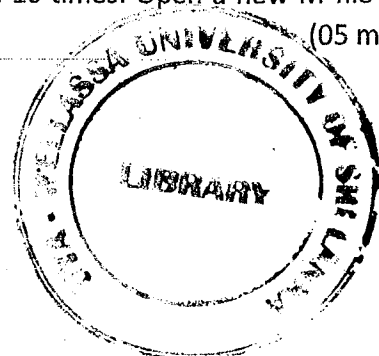
Please choose one: 2

Enter the radius of sphere: XX.XX

The volume is XX. XX.

(15 mark)

- b. Modify, using a 'for loop' that will iterate above program 10 times. Open a new M-file and save it as **q4b.m**. (05 mark)



Useful Formulas for Question no. 04

- The volume (V) of a cylinder is given by $V = \pi r^2 h$, where r is the radius of the circular bases and h is the height.
- The volume (V) of a cone is given by $V = \frac{1}{3} \pi r^2 h$, where r is the radius of circular base and h is the height.
- The volume (V) of a sphere is given by $V = \frac{4}{3} \pi r^3$, where r is the radius.