MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

IV SEMESTER B.TECH. MAKE-UP EXAMINATIONS, JUNE 2017

SUBJECT: MATLAB FOR ENGINEERS [ELE 3287] (OPEN ELECTIVE – I)

REVISED CREDIT SYSTEM

Time: 3 Hours	Date: 23 June 2017	Max. Marks: 50

Instructions to Candidates:

❖ Answer **ALL** the questions.

❖ Missing data may be suitably assumed.

❖ Use of MATLAB help is allowed. Use of Internet is NOT allowed.

❖ Save your work regularly.

❖ Read the note given below every question carefully.

❖ Evaluation will be carried based on information available in the answer script **ONLY**.

1A. Write a MATLAB function with name 'mytoss' which does not have any input and output arguments. When the function is called from command window, it should randomly display 'HEADS' or 'TAILS'

In the answer booklet: Lines of codes **(03)**

1B. Write a MATLAB function with name 'arraysum' to realize the following:

Example 1:	Example 2:
Input: [5 6 9]	Input: [7 4 2]
Output: 20	Output: 13

Output should be the sum of input array elements

In the answer booklet: Lines of codes **(04)**

1C. Write a MATLAB function with name 'ecount' to count letter 'e' in the input string

In the answer booklet: Lines of codes **(03)**

2A. Solve following problems using MuPAD

P1. Plot: $r = \theta \cos \theta, \quad -2\pi \leq \theta \leq 2\pi$

P2. Evaluate the expression: $\sin x \, \cos^3 x, \, at \, x = \pi/4$

P3. Evaluate: $\int_{0.5}^{1} \frac{1}{1+x^3} dx$

P4. Evaluate: $\int_{0}^{5} \sin(e^{x/2}) dx$

In the answer booklet: Commands used in MuPAD for every problem with relevant solutions **(04)**

2B. Determine maxima and minima of the function:

$$f(x) = \frac{5x^2 + 8x - 3}{3x^2 + 2}$$

In the answer booklet: Commands used in MuPAD with obtained solutions **(02)**

2C. Fit a polynomial equation for the given set of data of temperature and pressure considering pressure as dependent variable. Which degree fit is more suitable for temperature range 0°C to 400°C?

Using interp1 function, carry out linear, pchip and spline interpolation for T = 250°C and compare it with the fitted result (find difference between fitted value and interpolated value)

Temperature (°C)	300	259	233	167	88	19
Pressure (bar)	2.07	1.8	1.65	1.17	0.59	0.13

In the answer booklet: Justification for choice of fit for the first part of question; calculation and results for second part of the question   *(04)*

3A. Create a GUI consisting of one edit text box and one push button. User will enter a positive integer in the edit text box and clicks on the button. A pop-up message box should appear informing whether the entered number is even or odd.

In the answer booklet: Callback function of the push button   *(04)*

3B. Create a GUI consisting of two edit text boxes, one static text box and two push buttons. User will enter numbers in the two edit text boxes.

Click on one of the push button should add the two entered numbers and show the result in the static text box. Click on other pushbutton should multiply the two numbers and display the result in the same static text box.

In the answer booklet: Callback function of the push buttons   *(06)*

4A. The ordinary differential equation of a series RL circuit connected to DC supply 'V' is:

$$V = Ri + V_L \text{ where, } V_L = L\frac{di}{dt}$$

Model this equation in Simulink. Assuming V = 5, R = 100, L = 10×10^{-3}, obtain the response of 'i' vs. time for 1 milliseconds

In the answer booklet: Simulink block diagram with rough sketch of output graph obtained   *(03)*

4B. Using Simscape tool box components, simulate a series RL circuit with R = 100Ω, L = 10mH connected to DC supply voltage V = 5V.
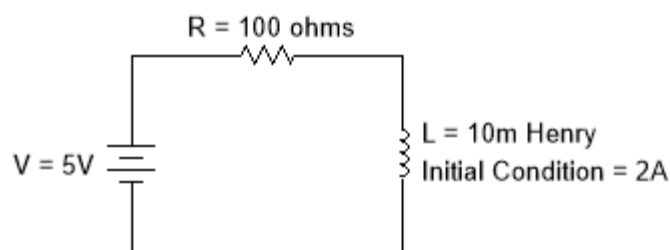
If the initial current in the inductor is 2A, what is the current through the inductor at time t = 0.2 milliseconds?

In the answer booklet: Simulink block diagram with value of current at time t = 0.2 milliseconds   *(04)*

4C. Using 'if condition' blocks, create pulses governed by a sinusoidal signal. During the positive cycle of the sine wave, the pulse should have high (1) value, and minus 1 (-1) during negative cycle of the sine wave.

In the answer booklet: Simulink block diagram only   *(03)*

5A. A LED is connected to digital pin 9 of Arduino Uno. Write a MATLAB program to blink the LED with ON and OFF time of 1 second

In the answer booklet: Callback function of the button **(03)**

5B. A digital PIR sensor sends a high (1) signal when an IR object is in its range. This sensor is connected to digital pin 7 of Arduino. Write a MATLAB program to turn ON an alarm connected to digital pin 9 when an IR object comes in the range of PIR sensor.

In the answer booklet: Lines of codes **(03)**

5C. A room has two doors, one dedicated for entry and other for exit. A PIR sensor is placed at both the doors to monitor the movement of the people.

Write a MATLAB code to dynamically count the number of occupants in the room. Assume that PIR sensors are connected to digital pin 8 and 9 of Arduino Uno which are dedicated for entry and exit doors respectively

In the answer booklet: Lines of codes **(04)**