



# UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

SECOND SEMESTER EXAMINATIONS, APRIL/MAY 2019

COURSE NO: EL 276  
COURSE NAME: MATLAB/SIMULINK FOR ENGINEERS  
CLASS: EL II TIME: 3 HOURS

Name: \_\_\_\_\_ Index Number: \_\_\_\_\_

**ANSWER ALL QUESTIONS IN YOUR ANSWER BOOKLET.**

*NB: All Codes Supplied Should be MATLAB Compliant*

## MATLAB BASICS (20 MARKS)

Consider the following matrices  $A = \begin{pmatrix} 1 & 3 & -8 \\ 7 & 5 & 2 \\ 6 & 4 & 0 \end{pmatrix}$  and  $B = \begin{pmatrix} 2 & 9 & -4 \\ 8 & 5 & 6 \\ -2 & 7 & 1 \end{pmatrix}$

**a. On creating another matrix C, made of B and A written side-by-side; provide the numerical outputs of the following MATLAB expressions (Questions 1 – 10).**

1.  $C(7) * C(16) + C(3) =$  \_\_\_\_\_
2.  $eye(3) * C(13) =$  \_\_\_\_\_
3.  $C(:, 4) =$  \_\_\_\_\_
4.  $C(2, [2:4, 6]) =$  \_\_\_\_\_
5.  $D = C(17) : C(1) : (C(5) + C(14)) =$  \_\_\_\_\_
6.  $A = C(4) * x + y; subs(A, x, 2) =$  \_\_\_\_\_
7.  $trace(g)$  is sum of diagonal elements of g. So,  $trace(A) - trace(B) =$  \_\_\_\_\_
8.  $D(2:end - 1) =$  \_\_\_\_\_
9.  $B.*A =$  \_\_\_\_\_
10.  $A+B - ones(3) =$  \_\_\_\_\_

**b. Provide short answers, phrases or words. (Questions 11 – 15):**

11. What do the commands *who* and *whos* have in common? \_\_\_\_\_
12. The command *inline* is used to write \_\_\_\_\_ while *linspace* helps to write \_\_\_\_\_
13.  $r = roots(c)$ . For this system,  $\frac{3x^2 - x}{2x^5 - 2x^4 + 3x^2 + 7x - 4}$ , what is *c*? \_\_\_\_\_
14.  $polyval([1 \ 2 \ 3], [1 \ 2 \ 3]) =$  \_\_\_\_\_
15. The code  $[m, n] = size(C)$  gives the output;  $m =$  \_\_\_\_\_ and  $n =$  \_\_\_\_\_

**SCRIPT WRITING (30 MARKS)**

**Program Writing.**

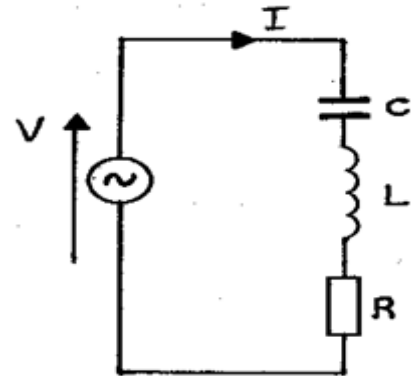
16. A 230 V, 50 Hz AC supply is applied to a coil of 0.06 H inductance and 2.5 Ω effective resistance connected in series with a 6.8 μF capacitor. Using the equations given below, write a MATLAB **program** to determine the Power offered by the RLC circuit. 16 Marks

$$P = \frac{V^2}{Z} \cos\phi \quad \text{but}$$

$$Z = [R^2 + (X_L - X_C)^2]^{1/2} \quad \text{where}$$

$$\text{Also, } X_L = 2\pi fL \quad \text{and} \quad X_C = \frac{1}{2\pi fC}$$

$$\text{and } \phi = \tan^{-1} \left( \frac{X_L - X_C}{R} \right)$$



NB: Program should include at least 2 comments. Take constant π to be 3.142.

**Function Writing.**

17. Write a **function** with an appropriate name that will accept two input parameters called length of conductor *l* and cross-sectional area *A* and then produce an output called resistance *R* based on the given equation;

$$R = \frac{\rho l}{A}$$

NB: At least three comments are required to serve as internal help file. 8 Marks

**Conditional Loop.**

18. Study the conditional **while** loop given and complete a table of ‘x’, satisfied condition and related output for each iteration performed by the loop till the last iteration. 6 Marks

```
x = 1;
while x * 10 < 50
disp(3*x)
x = x^2 + 1;
end
```

x	Condition	output
-	-	-
-	-	-
-	-	-

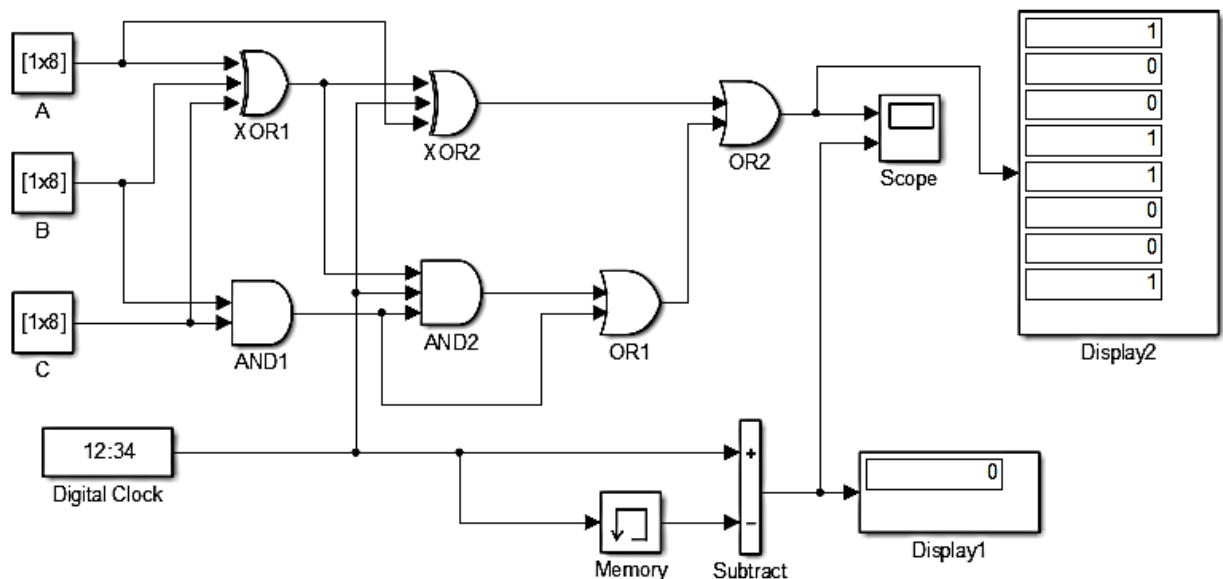
**PLOTTING (20 MARKS)**

19. Using *subplot* and plotting commands, write **ONLY MATLAB codes** to plot the graphs on figure two (2) in the exact locations shown in the given table matrix below.

area plot of a 3x3 magic matrix	plot of $\sin(100\pi t)$ where $t$ is a known array.
horizontal <b>Bar</b> chart of a 3x3 magic matrix	combined <b>stem</b> plot of $\sin(100\pi t)$ and <b>line</b> plot of $\sin(30\pi t)$ using <b>hold on</b> .
<i>pie chart</i> of a list of prime numbers less than 10	<b>3d vertical bar chart</b> of the list of prime numbers less than 10

**SIMULINK (15 MARKS)**

Use the Simulink Model to Answer Questions under this SIMULINK Section.



20. Select two blocks respectively that are likely found in i) Simulink Sinks Library and ii) Simulink Sources Library.
21. Write down the inputs for blocks A, B and C that will produce all possible outputs of the given number of binary inputs.
22. Mention the input combinations that produced the output values of 1 in Display2.
23. The time 12:34 on the digital clock, when changed to 10:55, will plot multiple outputs of how many singular inputs?
24. Mention one way of placing the Simulink model in MS PowerPoint presentation.
25. Sketch the nature of expected *blank graph page* prepared in *Scope* to receive the input command set.