Section B – Answer ANY TWO (2) questions from this section.

Question 1   [10 Marks]

a) Using the built-in functions (*zeros, ones, eye*). Create the following matrix.

$$A = \begin{bmatrix} 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

b) Given the linear system

$$3u + 7v - 2x + 3y - z = 37$$
$$4u + 2z = 40$$
$$5x - 4y + z = 12$$
$$2v + 9x + 4y + 3z = 14$$
$$5y + 8z = 20$$

Put the equation above into matrix $Ax = B$ and write MATLAB script to solve for x.

Question 2   [10 Marks]

a) Using the initial matrix in a), create a script that generate a matrix with the leading diagonal alternating with even and prime numbers in ascending order and random number elsewhere. Note that *matrix*(1,1) should be even number.

b) Give MATLAB commands to plot on the same figure, the following two functions:

$$f = 3t^2 + 2t - 0.5, \qquad g = 2t \cos(t)$$

Where the variable t varies from 0 to 10 with step size of 0.5. Draw the function f in blue $\cdot-$ and g in red $*$. Give title to the graph and label the axes.

Question 3   [10 Marks]

a) The electricity accounts of Electrical and Computer Engineering students in UENR Hostel are
    calculated as follows:

➤ if 500 units or less are used the cost is 2 cents per unit;

➤ if more than 500, but not more than 1000 units are used, the cost is $10 for the first 500 units,
and then 5 cents for every unit in excess of 500;

➤ if more than 1000 units are used, the cost is $35 for the first 1000 units plus 10 cents for every
unit in excess of 1000;

➤ in addition, a basic service fee of $5 is charged, no matter how much electricity is used.

Write a MATLAB script which enters the following five consumptions into a vector, and uses a for
loop to calculate and display the total charge for each one: 200, 500, 700, 1000, 1500.
Display the results in two columns: one for the electricity used in each case, and one for amount
owed.

% Electricity accounts of Electrical & Computer Engin Students
  In UENR Hostel.
     q = 200 : 1000 : 1500
   q1 = 500 ; q2 = 1000 ; q3 = 1500 ; B = $5

if (q1 <= 2cents (
   ('display total charge for 200,500,700 plus B for each amount).

End

   if q1 > $10 <= $20 & q2 + A => 5cents.
       ('display total charge plus Basic service fee')
End

   if q2 > $35 && q2 + q3 => 10cents
       ('display total charge plus Basic service fee).
end.

Display 2col
   col 1 = Electricity used
   col 2 = Amount owed.