Attempt **ALL** questions Name:…………………………………

**Q1**

Write the answers to the following Matlab statements:

1. >>6+(5\*10)^2 - 5

ans = ………………………………….

1. >>64^(1/3) + 32^(0.2)-sqrt(100)

ans = ……………………………………..

1. >>32^0.2+ 81^0.5-27^1/3

ans = ……………………………………..

1. y = 17/2\*i

ans = …………………………………………..

1. x = 21/2i

ans = ……………………………………………. [10 marks]

**Q2**

1. Write a set of Matlab instruction to give the solution of the following simultaneous equations using matrix operation.

*x* + 10*y* + 3*z* = 47

2*x* + 7*y* – *5z* = 60

*3x* – *y* + *2z* = 7 [6 marks]

Ans.

1. If some of the answers to the above is given in the table below. Write this answer in

long format and in short format

|  |  |  |
| --- | --- | --- |
| Orginal value | Long Format | Short Format |
| 5.81615405743200712387 |  |  |
| -2.7522154057432007123 |  |  |

[4 marks]

**Q3**

Write what the following Matlab expressions give:

1. >>syms x y

>>factor(x^2-1)

ans = …………………………………………………………………………… [3 marks]

1. >>syms x

>>E = x^2+6\*x+7;

>>G = subs(E,x,2)

G = …………………………………………………………………………… [3 marks]

**Q4**

The following Simulink model represents a certain engineering problem.

1. Write the equation for this model and [10 marks]
2. state the name and the function of each block. [10 marks]



**Q5.**

The diagram shows the Free Body Diagram of a car. If we assume the car to be travelling on a flat road, the system equation for the horizontal forces may be given by:



Where:·(**v**) is the horizontal velocity of the car (units of m/s).

· (**F**) is the force created by the car's engine (units N)

· (**b**) is the damping coefficient for the car, (units of N\*s/m).

* (**M**) is the mass of the car (units of kg).

Take (M) = 1000 kg and (b) = 40 N\*sec/m

**You are required to do the following:**

1. Re-write the system’s **(second order)** differential equation, suitable for building the model. Make sure you include all given numerical values for the constants. [5 marks]
2. Draw by hand a clear Simulink model as you would do on computer – make sure you add an input signal (as a step input) and show the output block. Also, you must label **all blocks and arrows**.

[10 marks]

1. If a step input is used, draw a sketch (by hand) to show the input and output graphs that you expect to get after simulation. [5 marks]