Knowledge is Wealth (*Sapientiadivitiaest*)

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DEPARTMENT OF PHYSICAL SCIENCES

EXAMINATION FOR THE AWARD OF BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONIC ENGINEERING
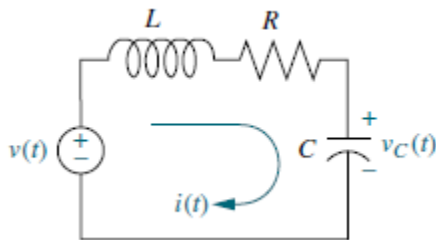
EENG 271 CONTROL SYSTEM I

INSTRUCTIONS:

Answer ALL questions

Do not write on the question paper

QUESTION ONE 30 Marks

a) **What is a Control System? (2 marks)**
b) **Find the transfer function represented by   (4marks)**
c) **Find the transfer function relating the capacitor voltage, $V_C(s)$ to the input voltage, V(s) in Figure below**. **(4marks)**

d. **State two advantages of a frequency domain (2 marks)**
e. **Define state variable (2 marks)**
f. **Define poles of a transfer function in time domain (2 marks)**
g. **Define stability in control system (2 marks)**
h. **State three Advantages of Root Locus Technique (3 marks)**

i. **What is a root locus? (2 marks)**
j. **State five advantages of an open loop control system. (4 marks)**
k. **Show mesh equation for the below circuit for electrical analogous (3 Marks)**
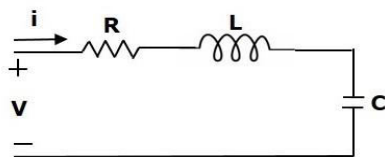
QUESTION TWO 20 Marks

a. Given the following differential equation, solve for y(t) if all initial conditions are zero. Use the Laplace transform. (16Marks)

$$\frac{d^2y}{dt^2} + 12\frac{dy}{dt} + 32y = 32u(t)$$

b. What are some of Effects of the Addition of an Observer to State Feedback (4 marks)

QUESTION THREE 20 marks

a. Explain FIVE basic requirement of good control system (10 Marks)
b. Differentiate between Open Loop and Closed Loop (10 Marks).

QUESTION FOUR 20 MARKS

Use block diagram reduction rule to solve the following diagram. (20 marks)