

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination and Control Division
Model Questions

Exam	Regular		
Level	BE	Full Marks	60
Programme	BME	Pass Marks	24
Year/Part	III/II	Time	3 hrs

Subject: Mechatronics (ENME 368)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt **All** questions.
- ✓ The Figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

QN	Questions	Marks
1.	Discuss in detail about the components of mechatronic system. Design a mechatronic system for weight measuring system.	[6]
2.	Derive the differential relationship between applied voltage v and output voltage v_c for the electrical system shown in Figure 1.	[6]
3.	Explain the following terms i. Hydraulic Resistance ii. Hydraulic Capacitance iii. Hydraulic Inertance iv. Pneumatic Capacitance due to change in volume v. Pneumatic Capacitance due to compressibility vi. Thermal Capacitance	[6]
4.	An inverting amplifier has an input resistance of 2 k Ω . Determine the feedback resistance needed to give a voltage gain of 100.	[4]
5.	A voltmeter is specified as having ranges of 0 to 2V and 0 to 20V, with an accuracy of $\pm 1\%$ of the full-scale deflection. Give the readings with their accuracies when the instrument gives voltage readings of (a) 1.0V on the 0 to 2 V scale and (b) 4.0 V on the 0 to 20 V scale.	[4]
6.	Define an actuator and state its primary function in a mechatronic system. Explain the construction and working principle of a solenoid actuator with a neat diagram.	[2+2]
7.	A robotic positioning system requires high positioning accuracy, rapid response, and repeatable motion. Discuss the possible actuator choices among DC motor, BLDC motor, stepper motor and servo motor. Select the most appropriate actuator and justify your choice.	4
8.	a. Explain the working principle of R-2R ladder type DAC with a suitable block diagram. b. Explain the following ADC parameter i. Resolution ii. Accuracy iii. Conversion time iv. Sampling rate	[6]
9.	Explain the architecture of Intel 8085A with a neat block diagram.	[6]
10.	a. Explain how PWM can be used for DC motor speed control with a schematic diagram. b. Explain the architecture of an Artificial Neural Network with a neat diagram. Describe the input layer, hidden layer, output layer, neuron model, weights, bias, activation function, and learning concept.	[4] [6]

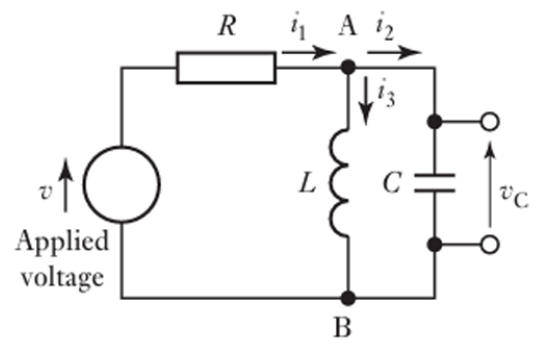


Figure 1