



School of Electrical and Electronics Engineering

Bachelor of Engineering (BENG)- Year 3

Electrical and Electronics Engineering

EEE618- Mechatronics

Semester 2, 2018

(Total Marks: 100    Duration: 3 Hours 10 Minutes)

November 2018

Date: As per time table            Time: As per time table

Venue: Special Examination

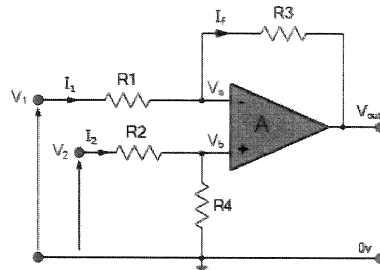
**Instructions to Candidates**

1. You will be allowed 10 minutes reading time and **3 hours** to complete this paper.
2. Begin each answer on a fresh page and use both sides of the sheet.
3. Please ensure that **your ID number** is written at the top of each sheet of paper used.
4. Insert all written pages, graph paper, drawing paper etc. in their correct sequences and secure with string.
5. For all sheets of paper on which rough/ draft work has been done, cross it through and you must attach all of them to your answer scripts.
6. Write clearly the numbers of the questions attempted on the top of each sheets.
7. Answer all questions.
8. Use of mobile phones, smart watches or any other electronics devices with electronics storage of data/communication is not allowed during the examination.
9. Use of only non-programmable scientific calculator is allowed.

*Total number of pages: 2 (three) including this cover page.*

**(All Questions are compulsory)**

1. (a) Find out the  $V_a$ ,  $V_b$ ,  $V_{out}$  if  $V_1=3V$ ,  $V_2=5V$  and the value of  $R_1 = R_2 = 1k\Omega$ ,  $R_3 = R_4 = 5k\Omega$  [10]



- (b) To properly acquire an analog voltage signal for digital processing, arrange the following components in right sequence and justify your answer with a block diagram. (i) analog-to-digital converter (ii) buffer amplifier (iii) low-pass filter (iv) Computer (v) Sample and hold amplifier. [10]
2. (a) Explain Sensor Signal Characteristics in Data Acquisition system in detail if the original voltage reading generated by a thermocouple is in the range of microvolts. [10]
- (b) Design a non-inverting active low pass filter circuit that has a gain of 10 at low frequencies, a high frequency cut-off or corner frequency of 159Hz and an input impedance of 10K $\Omega$ . [10]
3. (a) With neat block diagram explain in detail the various elements interconnection and information transmission in Mechatronics system. [10]
- (b) Define sensors and its specifications (i) Range (ii) Resolution (iii) Error (iv) Accuracy (v) Sensitivity [10]
4. (a) Describe the operation of the elements of a computer-based instrumentation system. [10]
- (b) Write any five applications of Linear Variable Differential Transformer sensors. What kind of primary transducer you require to measurement of linear displacement with an input range of about  $\pm 2$  to  $\pm 400$  mm. Explain working principle with neat diagram and justify your answer. [10]
5. (a) State the principle and construction of a Pyroelectric sensor and its application. [10]
- (b) Explain the importance of data conversion devices and its components comparator, encoder and ADC in mechatronics with block diagram. [10]

The End.