

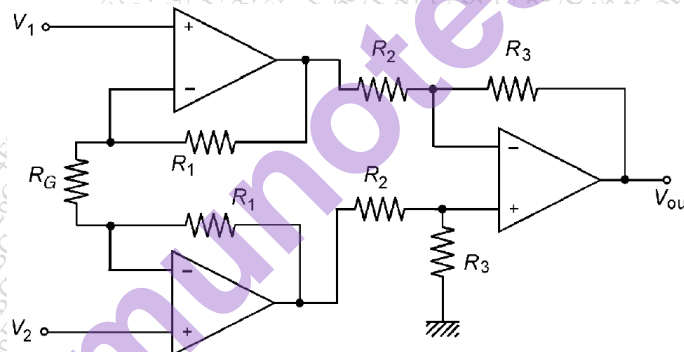
(3 hours)

[Total Marks: 80]

Note:

1. Question-1 is compulsory.
2. Answer any three questions from remaining five.
3. Assume suitable data if necessary.
4. Numbers in the right indicate marks.

1. Answer the following questions. (Each question carry 5 marks) 20
  - (a) Distinguish between linear valve and equal percentage valve.
  - (b) Draw circuit diagram of a basic RC band-pass filter. Sketch its frequency response clearly showing the expressions for cut-off frequencies.
  - (c) Describe any two discontinuous controller modes.
  - (d) What are two PLC operation modes? Describe both modes in brief.
2. (a) Draw basic pneumatic system and describe its components. 10
  - (b) Illustrate the working of V-to-I and I-to-V converters with neat circuit diagrams. 10
3. (a) Consider the instrumentation amplifier shown in figure below. Derive the expression for  $V_{out}$  and compute the resistors for the gain of 101. 10



- (b) What are the criteria for selecting controller mode for a given process? Describe the ratio controller with clearly specifying the types of processes for which it is used. 10
4. (a) An integral controller is used for speed control with a setpoint of 12 rpm within a range of 10 to 15 rpm. The controller output is 22% initially. The integral gain  $K_I = -0.15\%$  controller output per second per percentage error. If the speed jumps to 13.5 rpm, calculate the controller output after 2s for a constant  $e_p$ . 10
  - (b) Draw the basic structure of PLC and describe its components in detail. 10

[TURN OVER]

5. (a) Develop the physical ladder diagram for a motor with the following: NO start button, NC stop button, thermal overload limit switch opens on high temperature, green light turns on when running, red light turns on for thermal overload. 10
- (b) What is a Data Acquisition System (DAS)? Describe, with clear diagram, working of a typical DAS. 10
6. Answer any two of the following questions. 20
- (a) Write a short note on SCADA.
- (b) What is the scope of standard NEMA 250? Describe its features in brief.
- (c) List any five SAMA symbols. Draw clear symbol with brief description.