

**Question No. 1** [30 Marks]

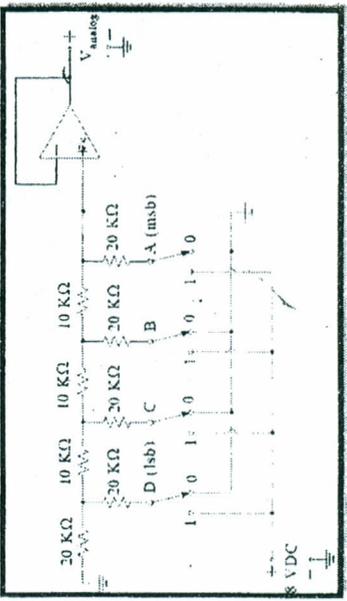
- A. A thermocouple gives an output of 0.4 mV for each degree change in temperature. What will be the word length required when its output passes through an analogue-to-digital converter if temperatures from 0 to 200°C are to be measured with a resolution of 0.5°C?
- B. A dial gauge is used to measure the pressure in a vessel. The readings are 7.25 KN/m<sup>2</sup> for a dial reading of zero and 26.6 KN/m<sup>2</sup> for a reading of 100. If the variation is linear. What would be the value of pressure for a dial reading of 95?
- C. Sketch the Bourdon tube

**Question No. 2** [15 Marks]

- A. The left leg of a U-tube mercury manometer is connected to a pipeline conveying water, the level of mercury in the leg being 0.8 m below the right leg which is open to atmosphere. The level of mercury in the right leg is 0.6 m above that in the left leg and the space above mercury in the right leg contains benzene (specific gravity 0.88) up to a height of 0.4 m. find the pressure in the pipe

**Concerning the shown figure**

- B. What is the analog voltage value that outputs when ABCD "A is LSB" switch positions is 0100?  
1.0 V
- C. What is the analog voltage value that outputs when ABCD "A is LSB" switch positions is 1001?  
4.5 V

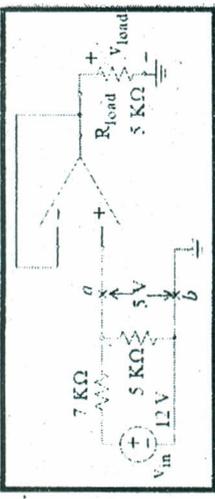
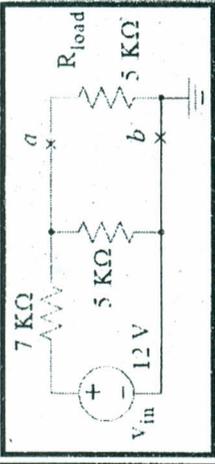


**Question No. 3** [15 Marks]

- A. How capacitance level measurement could be used to measure the level of a **conductive or nonconductive fluid**
- B. when transmitters are mounted below the high side tap, a zero-point adjustment is required. This is called "Zero suppression" — **Please clarify this point**
- C. Pressure sensing must be done against some reference — **Please comment.**

**Question No. 4** [15 Marks]

For the circuit shown



- A. with the load  $R_{load}$  disconnected, compute the open circuit voltage  $V_{ab}$
- B. With the load connected, compute the voltage  $V_{load}$  across the load  $R_{load}$
- C. With the insertion of the **buffer amplifier** between points a and b and the load, the circuit now is as shown above on the right, What is the value of the  $V_{load}$  ?

**Question No. 5** [15 Marks]

- A. Commercial integrated A/D converters are readily available for instrumentation applications. Several techniques are used for the conversion of analog signals-to-digital signals—
- List down the most common form of these A/D converters
  - Hold a comparison between them
- B. **Complete [7 Marks]**
- \_\_\_\_\_ transmits its change in buoyancy (mechanical force) to a transducer through a torque-tube unit. However, the element does not actually float; it is submerged in the liquid being measured.
  - \_\_\_\_\_ are low in cost and simple in design. They are also accurate and reliable. However, for turbulent liquids they require the use of stilling wells
  - \_\_\_\_\_ devices cannot be used to measure the level of foam because the sound signal is absorbed by foam. Also, since the operation of these devices depends on the speed of sound, they will not work in a vacuum
  - Difference between measured pressure and a perfect vacuum is called \_\_\_\_\_
  - an \_\_\_\_\_ tube manometer gives increases sensitivity for low-pressure
  - The \_\_\_\_\_ is one of the most widely used transducers for converting a mechanical displacement to a proportional output voltage
  - \_\_\_\_\_ pressure tube; this configuration is more sensitive than the circular bourdon tube

BEST WISHES

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