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# CS/B.TECH/BME(0)/SEM-5/BME-503/2012-13 2012 ANALYTICAL AND DIAGNOSTIC EQUIPMENT

Time Allotted: 3 Hours Full Marks: 70

The figures in the margin indicate full marks.

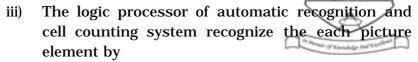
Candidates are required to give their answers in their own words as far as practicable.

# GROUP - A ( Objective Type Questions )

- 1. Answer any *ten* of the following :  $10 \times 1 = 10$ 
  - A. Choose the correct alternatives for the following:
    - i) Which parameter of a substance in a solution is measured by colorimeter?
      - a) Density
- b) Concentration
- c) Molecular weight d) Colour.
- ii) Generally, the orifice diameter of Coulter counter is
  - a) 25 μm
- b) 50 μm
- c) 75 µm
- d) 100 µm.

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- a) 'ON' status
- b) 'OFF' status
- c) 'ON' and 'OFF' status
- d) 'SIZE' AND 'SHAPE' status.
- iv) The light is dispersed in monochromatic of spectrophotometer by
  - a) Filter
  - b) Mirror
  - c) Diffraction grating or prism
  - d) Lens.
- v) The UV light wavelength is in the rage of
  - a) 200 400 nm
- b) 400 700 nm
- c) 700 800 nm
- d) 520 580 nm.
- vi) The ratio of the radiant power transmitted by a sample to the radiant power incident on the sample is known as
  - a) transmittance
- b) luminescence
- c) absorbence
- d) optical density.
- vii) In case of IR spectrophotometer, one of the common IR sources is
  - a) Deuterium lamp
  - b) Mercury lamp
  - c) Nernst filament
  - d) Tungsten-halogen lamp.
- viii) Electromagnetic blood flowmeter is based on
  - a) Lenz's law
- b) Beer-Lambert's law
- c) Faraday's law
- d) Fleming's law.

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- ix) Dilution curve is obtained from
  - a) Blood pressure measurement
  - b) Blood flow measurement
  - c) Cardiac output measurement
  - d) Colorimetric measurement.
- x) Lung volume and capacity are measured using
  - a) Pneumotachometer b) Potentiometer
  - c) Photometer
- d) Spirometer.
- B. Answer the following questions very briefly :
  - xi) What is 'Auger electron'?
  - xii) What is laparoscope?
  - xiii) Why is tungsten used in electron microscope?
  - xiv) What is the function of blood gas analyser?

#### **GROUP - B**

### ( Short Answer Type Questions )

Answer any *three* of the following questions.  $3 \times 5 = 15$ 

- 2. What are the different non-invasive techniques of blood flow measurement? Briefly explain.
- 3. Briefly describe cystoscopy giving emphasis on lithotripsy.
- 4. What are the different types of Flow sensing pneumotachometers? Briefly describe.
- 5. Describe the Beer-Lambert's law in spectrophotometer. Mention the name of the common practical IR sources in IR spectrophotometer. 3+2
- 6. Define Tidal volume of Respiratory system. Mention the relationship between tidal volume and minute volume. What is the function of Pneumotachometer? 2 + 2 + 1

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#### (Long Answer Type Questions)

Answer any three of the following questions.

 $3 \times 15 = 45$ 

- 7. Describe the pH measurement procedure using glass electrode with a neat sketch. Describe the Clark method of  $pO_2$  measurement. 8+7
- 8. Describe the cardiac output measurement by impedance technique. Describe the Coulter counter with a neat sketch.

7 + 8

- 9. Draw the block diagram of basic spectrophotometer type instrument with a small description. Why is the optical filter used in spectrophotometer type instrument? Describe briefly. Explain the basic principle of Calorimetric measurement of unknown sample. 4+6+5
- 10. Describe the Gas chromatography system with a basic schematic diagram. Explain the basic principle of Flame photometer.
- 11. a) Describe the basic components of a Scanning Electron Microscope.
  - b) Using a diagram show the path of electron beam through the lenses. Explain their roles in the formation of the image.
  - c) What are back scattered electrons? 5 + 7 + 3
- 12. a) Define systolic and diastolic pressures.
  - b) Describe one direct method of monitoring Blood Pressure.
  - c) When is direct method of Blood pressure measurement used? 2 + 9 + 4