N.B.: (1) Question No. **1** is **compulsory**.
    (2) Attempt any **three** questions out of remaining **five** questions.
    (3) Assume suitable data.
    (4) Use **legible** handwriting. Use black ball pen.

1. State with **reason** whether following statements are **true or false** :—
  (a) A rotating anode increases the total target area.   20
  (b) Photoelectric effect produces radiographic images of excellent quality.
  (c) Electron focusing in X-ray image intensifier tube inverts and reverses the image.
  (d) Doppler application requires High Q-factor transducer.
  (e) Computed Radiography is better than film-based radiography system.

2. (a) Explain the filament circuit and high voltage circuit of X-ray generator with neat diagrams. 10
  (b) List the specifications of X-ray machine. 5
  (c) What is the minimum wavelength produced in an X-ray tube when the potential difference across the tube is 130 KVp. 5
    $(h = 6 \cdot 6 \times 10^{-34}$ Js, $c = 3 \times 10^8$ m/sec, $e = 1 \cdot 6 \times 10^{-19}$ C)

3. (a) Explain the different types of endoscopes.
  (b) Explain the principle and construction of Image Intensifier tube used in Fluoroscopy. 10
    Explain the CCD camera. 10

4. (a) Explain with block diagram Computed Radiography system in detail. 10
  (b) Explain the principle behind thermographic imaging. State its applications in medicine. 10

5. (a) Define and explain Doppler Effect. Calculate the Doppler shift if blood is flowing at 25 cm/sec, operating frequency of transducer is 10 MHz and the angle that the sound beam makes with vessel lumen is 60°. 10
  (b) Discuss the different modes in Ultrasound display. 10

6. Write short notes on (any **four**) :—
  (a) Inherent and Added Filtration 20
  (b) X-ray film
  (c) Mammography.
  (d) Ultrasound Transducer
  (e) Three-phase X-ray generators.

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