

JAYA ENGINEERING COLLEGE  
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING  
EC2021-MEDICAL ELECTRONICS  
YEAR : III SEMESTER : VI

UNIT-I

1. Explain the factors that influence the design and application of a medical instrument system / Discuss the different characteristics of a medical instrument system. (8)
2. Explain the man-instrument system with a neat block diagram / Explain with a block diagram the components of the bio-medical instrument system. (8)
3. Discuss the problems encountered in measuring a living system / Discuss the major differences encountered between measurements in a physiological system as distinct from a physical system. (8)
4. Draw the structure of a living cell of our body and explain its constituents. (8)
5. Discuss the different ways of transport of ions through the cell membrane (4)
6. Give an account on the different chemical compositions in the intra and extra cellular fluids and their effects in the case of blood serum. (2)
7. Discuss the development of action potential and muscular contraction. (8)
8. Explain with a neat diagram the resting potential (8)
9. Explain polarization, depolarization the depolarization (8)
10. Draw the circuit diagram of an ECG isolation amplifier and explain its action. (8)
11. Draw the block diagram of an EEG unit and explain the different parts in it. (8)

UNIT- II

1. What is meant by vector cardiograph and how it is accomplished? (4)
2. In the case of ultrasonic blood flowmeter, using transit time method, the timer in that flowmeter gives the difference between upstream and downstream transit times as 1.7 nanoseconds and the angle between the direction of the flow and the central axis of the ultrasonic beam is about 150. The perpendicular distance between the transmitting and receiving transducers situate in the blood vessel is about 2 cm. The ultrasonic velocity in blood is 1500 m/s. Calculate the velocity of the blood flow in that vessel. (4)
3. In the case of indicator dilution method for the cardiac output measurement, 10 mg of indicator dye is injected. The area under the dilution curve is found to be 150 mgs/litre. Calculate the cardiac output per minute. (4)
4. Calculate the velocity of the blood flow in a blood vessel using the following data. The velocity of ultrasonic waves in blood is 1500 m/s. The angle between direction of the blood flow and direction of incident ultrasonic beam is about 300 The Doppler shift in frequency is about 231Hz when the incident ultrasonic frequency is 2 MHz. (4)
5. Explain the following electrodes with neat diagram  
(i) Hydrogen (8)  
(ii) pH (8)
6. Explain the following electrodes with neat diagram  
(i) Pco<sub>2</sub> (8)  
(ii) Po<sub>2</sub> (8)
7. What are biomedical electrodes? Explain the electrode PHCO<sub>3</sub> with neat diagram. (8)
8. Explain the following photometers with suitable diagrams.  
a. Filter photometer (8)  
b. Flame photometer (8)

UNIT –III

1. Describe the cardiac pacemaker waveforms and explain their importance. Compare external and implanted pacemakers. (8)
2. Explain with a diagram the ventricular asynchronous pacemaker (fixed rate pacemaker). (8)
3. Explain the ventricular synchronous pacemaker. (8)
4. Explain working principle of demand pacemaker with a diagram. (8)
5. Explain the atrial synchronous pacemaker. (8)
6. Explain with a neat diagram, the working principle of D.C. defibrillator. (8)
7. Explain the various modulation techniques used for transmitting a biosignal in a telemetry system (8)

UNIT – IV

1. Discuss in detail the radiation therapy techniques. (8)
2. Explain with suitable diagram the diagnostic X –Ray machine. What are the applications of X-Ray examination? (16)
3. Explain with suitable diagrams the working principle of the two types of scintillation detectors for gamma radiation. (8)
4. With a block diagram, explain the instrumentation system for radioisotope procedures. (8)
5. Write short notes on the following detectors for beta radiation:  
(a) Gas flow counter (4)  
(b) Liquid scintillation counter (4)
6. Draw the schematic diagram of a G.M. counter and explain its working details. (8)

7. Explain the following radiation detectors.
  - (a) Expansion type cloud chamber (4)
  - (b) Diffusion type cloud chamber (4)
  - (c) Bubble chamber (4)
8. Describe the principle of visualizing body organs by radioisotope methods. (8)
9. List out the properties of X-Rays (4)
10. Write short notes on angiography (4)
11. Explain the working principle of image intensifier with a neat block diagram (8)

#### UNIT-V

1. Explain with block diagram the infrared thermograph technique and its merits and demerits. (8)
2. What are the medical applications of thermography (8)
3. Mention the details of laser instrumentation for biomedical applications. (8)
4. Discuss the laser principle and mention the different laser interactions on our body. (8)
5. Write short notes on HE-NE laser and the general applications of laser in medicine (8)
6. What are the uses of endoscopes in medicine? Describe any one of the therapeutic instrument using an endoscope. (8)
7. What are the different types of commonly available endoscopes and their diagnostic applications? (4)
8. Explain the liquid crystal thermograph in brief. (4)
9. What are the techniques involved in electro surgery techniques using diathermy units? (8)
10. Draw the block diagram of short wave diathermy unit and explain. (8)
11. Draw the block diagram of ultrasonic diathermy. (8)
12. Explain in brief the salient features of microwave diathermy. (4)
13. Discuss the range and area of irritation of different heating techniques in diathermy. (4)
14. Give an account on biological effects of radiation exposure and safe dose equivalent limits. (8)
15. Describe the construction and working of any one of the personnel radiation monitoring equipment (8)
16. Write a note on area monitoring in the case of radiation safety. (8)
17. Explain the physiological effects of current at commercial frequencies on human body (8)
18. Describe the possibilities of occurrence of micro shock hazards in a hospital. (16)
19. Bio Medical Laser (8)