

Exam Date & Time: 01-Jul-2023 (02:30 PM - 05:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

FOURTH SEMESTER B.TECH MAKE-UP EXAMINATIONS, JULY 2023
BIOMEDICAL INSTRUMENTATION - I [BME 2252]

Marks: 50

Duration: 180 mins.

A

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

- 1) With a neat figure, illustrate how photo resistors can be used to measure pulse of a subject. (5)
 - A)
 - B) Determine the total change in length for a strain indicator wire in a strain gauge when gauge factor =3, original wire resistance= 0.5Ω , final strained wire resistance = 0.7Ω and pre-strained wire length= 50mm. (3)
 - C) Determine the limitations of conventional X-rays over CT imaging. (2)
- 2) With a neat figure, interpret the equivalent circuit model of an electrode in a cell. (5)
 - A)
 - B) Describe the key factors to be considered in the design of a defibrillator electrode. (3)
 - C) Explain 'driven right leg lead'. What is the purpose of this connection in the ECG machine? (2)
- 3) What is 'Doppler effect'? Explain in detail, the non-invasive technique of measuring blood flow velocity. (5)
 - A)
 - B) Interpret the code 'VOO' and explain the pacemaker which is identified by this code. (3)
 - C) What is the energy stored by the lithium- iodide battery, if the battery rating is 1Ah with a terminal voltage of 1.5V. (2)
- 4) In case of a fast heart rhythm, which type of defibrillator would be ideal to treat the condition. Justify your answer and explain the specific type of defibrillator in detail. (5)

- A)
- B) A blood vessel having a radius of 0.4cm has a blood velocity of 10cm/sec. A magnetic flow probe with a magnetic field of 1×10^{-5} weber/ m² surrounds the blood vessel. Calculate the voltage induced in the probe. (3)
- C) Explain how 'double insulation' method can help in preventing electrical accidents. Also, mention the drawback of this method. (2)
- 5) With neat figures, illustrate the structure of three different types of defibrillator electrodes. (5)
- A)
- B) Differentiate suction cup electrodes from floating electrodes. Also indicate if there is any advantage of using microelectrode for ECG recording as compared to surface electrodes. (3)
- C) In the context of lasers, differentiate spontaneous emission from stimulated emission. (2)

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