Semester 8th .

Time: 10.00 am to 01.00 pm

ORGANISATION OF ISLAMIC COOPERATION (OIC) DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Course Number: IPE 4873 Course Title: Biomedical Engineering Summer Semester: 2022-2023 Full Market 150 Time: 3 hours

Answer all the 6 (six) questions below. The distribution of marks and the CO-PO mapping are given

Q1. (a) Differentiate biomaterial from biological material and state the properties of an ideal biomaterial. Classify of different types materials used as biomaterials and (COL, POI) identify their pros and cons, and applications in various biomedical engineering

(b) Discuss the application of biomaterial in oral and cardiovascular systems. O2. (a) Define with examples the orthopedic prosthesis and orthosis. Make a short note 1101

on the fundamental considerations needed for the designers of orthotic and (CO1, PO1) prosthetic devices. Analyze the following figure (Fig. 1) and provide a discussion in the context of the application of biomaterial in rehabilitation engineering.



(b) Briefly describe the different compositions of blood. Mention the normal range of blood pressure and identify different symptoms of high and low blood (CO1, PO1) prossures. Given that the stroke volume is 73 cm3 and the heart rate is 75 hpm. calculate the cardinal output.

Q3. (a) Define tissue regeneration and the steps in tissue engineering process. Describe with a schematic figure the electrospinning process for tissue engineering (COI, POI) Q4. (a) Dows a flow Land of generalized medical instrumentation system and describe all 118 (CO), POS)

(D) Deriva flow Land of generalized medical instrumentation system and describe all 118 (CO), POS)

(D) Define accuracy, precision and bias. A sphymnomanometer reads systalic PI pressure as 130, 155, 120, 130, 125. Determine the accuracy, the precision and (CO), POS) the bias of the sphymnomanometer.

Q5. (a) Briefly describe the physics and technologies used in ECG, EEG, PCG, EMG [11]

mathematical formulations: i) lumped mass models, ii) multi-body models and iii) (CO1, PO1) finite element (FE) models. Draw a flow chart and describe the development

(a) Briefly describe the physics and technologies used in ECG, EEG, PCG, EMG (any three); write the full form, functions and applications on the body parts. Draw and identify normal and abnormal signals by these instruments used for disenosis;

diagnosis.

(b) Describe any one invasive and one noninvasive blood pressure measurement [10] techniques and their advantages and disadvantages. Draw relevant schematic (CO3, PO5) diagrams.

diagrams.

Q6. (a) Classify medical imaging medalities. Give examples of each modality Identify the medical imaging technique of the following images (Fig. 2) that generate (C images as slices and show the anomalies in the brain tissues. Describe the physics of this imaging technique with necessary schematic figures, the advantages and



Figure 2

(b) Ultrasound imaging (conography) uses high-frequency sound warves to view soft tissues such as muscles and internal organs. Britchy describs the working principle and the advantages and disadvantages of this imaging technique. Identify the ranges and discuss the purposes of the following three ultrasound images (Fig. 3).

