abnormalities) can be gained.

(CO1. PO1)

PO2)

PO2)

(CO2.

(CO2.

PO2)

(CO2.

PO2)

10

(COL

PO1)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT) ORGANISATION OF ISLAMIC COOPERATION (OIC)

## DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Summer Semester, A. Y. 2022-2023

Course No.: EEE 4871 Time: 3 Hours Course Title: Biomedical Signal Processing

There are 3 (three) questions. Answer all 3 (three) questions. The symbols have their usual meanings. Programmable calculators are not allowed. Marks of each question and corresponding COs and POs are

written in the brackets. 10

1. a) Explain in detail how ECG captures the electrical activity of the heart.

POI) b) Explain how through examining ECG important insights (e.g. identifying different 10

A group of researchers want to identify and locate brain tumors in patients. For this purpose, they took scans through CT and MRI. However, the quality of the images

was not very good. So, they needed to take certain image preprocessing steps for

a) At first, they decided to enhance the quality of the images. For this, they selected three different techniques: Contrast adjustment, histogram equalization, and gamma (CO2,

b) Secondly, they wanted to locate the boundary of the tumor. For this, they selected three different techniques: Dynamic thresholding, region growing, and clustering, (CO2.

Discuss the above-mentioned techniques and explain which one you think would be better suited for this task.

One of the researchers suggested using Neural Network based approaches for segmentation. U-Net is the most popular CNN architecture for image segmentation.

purpose. Discuss the operation of different edge-detection filters and explain how

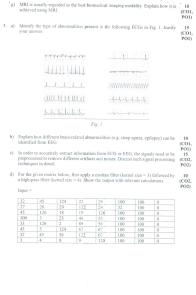
be used for tumor detection in the brain.

Discuss how it works with proper illustrations. d) One of the researchers suggested that edge-detection filters can also be used for this

these techniques would fare compared to other segmentation techniques. e) After segmenting the ROI, the researchers need to decide the presence of a tumor as

well as the severity of the situation. For this purpose, they choose the following quantification techniques: Compactness. Chain codes, and statistical moments.

Explain how these techniques can be utilized for quantification. Another researcher suggested using other imaging modalities: OCT and PET. Discuss how these two biomedical imaging techniques work and whether they can



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