

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI 2 2016/2017

BEU6213 : MEDICAL IMAGING

TARIKH : 7 JUN 2017

MASA : 2.00 PTG –5.00 PTG (3 JAM)

Kertas ini mengandungi **ENAM (6)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan berstruktur. Jawab SEMUA soalan.

QUESTION 1**SOALAN 1**

(a) Scientists have learned that radiation sources are naturally all around us. Radiation can come from far away as outer space and from as near as the ground that you are standing on. Explain what is meant by radiation and its categories.

Ahli-ahli sains telah mengetahui bahawa sumber radiasi secara semula jadi di sekeliling kita. Sumber Radiasi adalah dari sejauh angkasa lepas dan seberapa hampir dengan anda. Terangkan apa yang dimaksudkan radiasi dan jenis radiasi.

[8 marks]

[8 markah]

b) With reference to **Figure 1**, calculate the received relative intensity at the detecting transducer from interface 3. (Ignore ultrasound absorption due to its movement through various matters (medium)).

Merujuk kepada Rajah 1, kirakan keamatan relative penerimaan pada transducer pengesan daripada perantaramuka 3. (abaikan penyerapan ultrasound yang disebabkan oleh pergerakan daripada pelbagai medium).

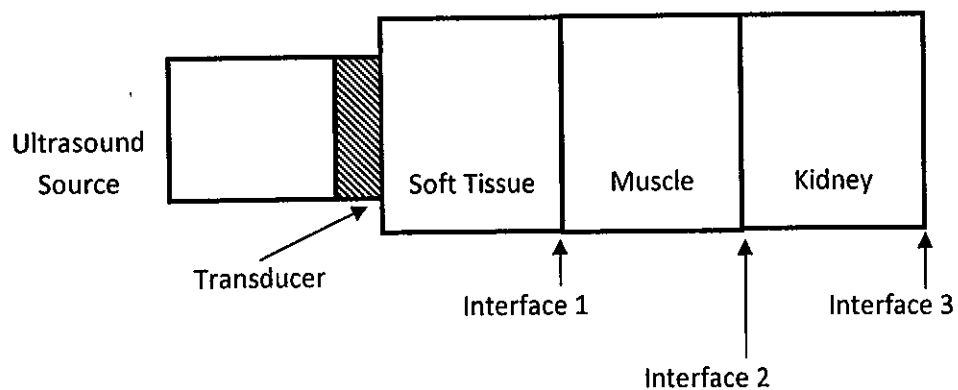


Figure 1/ Rajah 1

CLO1
C4

Given the formula as below:⁶

Diberikan formula seperti di bawah:

$$\frac{\text{reflected Intensity}}{\text{Incident Intensity}} = \left\{ \frac{(\rho^c)_{\text{medium 1}} - (\rho^c)_{\text{medium 2}}}{(\rho^c)_{\text{medium 1}} + (\rho^c)_{\text{medium 2}}} \right\}^2 \times 100\%$$

Table 1: Speed of ultrasound and acoustic impedance in some common materials. Data from Wells (1969); Goss, Johnston, Dunn (1978); and Bamber (1986). The acoustic impedance cannot be calculated where the density of the material is not known.

Material	Speeds (m/s)	Acoustic impedance g/cm ² s
Air (NTP)	330	0.0004 × 10 ⁵
Fat	1450	1.38 × 10 ⁵
Kidney	1560	1.62 × 10 ⁵
Muscle	1580	1.70 × 10 ⁵
Soft tissue (average)	1540	1.63 × 10 ⁵

[17 marks]

[17 markah]

QUESTION 2

SOALAN 1

CLO1
C3

- a) In diagnostic radiography, X-rays can be used to investigate the patient's illness or physical state. Illustrate the operation of an X-ray tube.

Dalam rawatan radiograph, x-ray boleh digunakan untuk menyelidik penyakit pasakit dan kadar fizikal. Gambarkan operasi tube x-ray.

[4 marks]

[4 markah]

CLO1
C4

- b) Draw the block diagram of an X-ray equipment consists of X-ray tube, collimator, Bucky Grid and X-ray detector.

Pembentukan pengimejan CT adalah proses berbagai langkah.

[8 marks]

[8 markah]

CLO1
C4

- c) The formation of the CT image is a multi-step process. Explain each of the processes.

Pembentukan pengimejan CT adalah proses berbagai langkah. Membentuk setiap proses.

[13 marks]

[13 markah]

QUESTION 3

SOALAN 3

CLO2
C3

- a) List **FOUR (4)** characteristics for the mammography imaging compare to conventional x-ray.

Senaraikan EMPAT (4) ciri-ciri yang didapati dalam penggunaan mammography jika dibandingkan dengan penggunaan x-ray biasa.

[4 marks]

[4 markah]

CLO2
C4

- b) Explain how the exchanged Radio Frequency (RF) energy between the imaging system and patient's body take place by using an appropriate diagram.

Terangkan bagaimana perubahan tenaga Radio Frequency (RF) di antara sistem pengimejan dan penglibatan badan pesakit dengan menggunakan diagram yang berkaitan.

[8 marks]

[8 markah]

CLO2
C5

- c) Magnetic Resonance Imaging is an imaging modality which uses non ionizing radiation. Compare this modality with X-ray and CT scan which use ionizing radiation

Magnetic Resonance Imaging adalah modality pengimejan yang menggunakan sinaran tidak mengion. Bezakan pengimejan modality ini dengan X-ray dan CT Scan yang menggunakan sinaran mengion .

[13 marks]

[13 markah]

QUESTION 4

SOALAN 4

CLO2
C3

- a) A radioisotope of iodine, ^{131}I , has a half-life of 4 hours. Its activity was measured as 160 MBq at 08:00 on 3rd February 2014. Calculate its activity at 08:00 on 4th February 2014.

Radioisotope iodine, ^{131}I mempunyai separuh hayat selama 4 jam. Aktivitinya diukur sebanyak 160 MBq pada pukul 8:00, 3 February 2014. Kirakan aktivitinya pada pukul 8:00 4 February 2014.

[8 marks]

[8 markah]

CLO2
C4

- b) i) Explain the principle of controlling the radiation exposure by using shielding, time and distance.

Terangkan prinsip mengawal pendedahan radiasi dengan menggunakan perisai (penghadang), masa dan jarak.

[6 marks]

[6 markah]

- ii) There are two major examples of the Exponential Law in radiographic sciences which are radioactive decay and the attenuation of electromagnetic radiation by matter. Explain the attenuation of electromagnetic radiation by matter complete with relevant diagram.

Terdapat dua contoh utama bagi Exponential Law dalam sains radiographic di mana pelemahan radioactive bagi sinaran elektromagnetik oleh bahan.

Terangkan pelemahan sinaran elektromagnetik oleh bahan dengan menggunakan gambarajah berkaitan.

[11 marks]

[11 markah]

SOALAN TAMAT