SULIT

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI DISEMBER 2015

EU601: MEDICAL IMAGING

TARIKH : 08 APRIL 2016
MASA : 8.30 PG – 10.30 PG (2 JAM)

Kertas ini mengandungi **LAPAN (8)** halaman bercetak.
Bahagian A: Struktur (10 soalan)
Bahagian B: Esei (3 soalan)
Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A : 40 MARKS
BAHAGIAN A : 40 MARKAH

INSTRUCTION:
This section consists of **TEN (10)** structured questions. Answer **ALL** questions.

ARAHAN:
*Bahagian ini mengandungi **SEPULUH (10)** soalan berstruktur. Jawab semua soalan.*

CLO1
C1

QUESTION 1
Define the wave terms below:

a. Reflection
b. Refraction

SOALAN 1
Definisikan terma gelombang berikut:

a. Pantulan
b. *Pembiasan*

[4 marks]
[*4 markah*]

CLO2
C2

QUESTION 2
Explain briefly acoustical impedance.

SOALAN 2
Jelaskan dengan ringkas galangan akustik .

[4 marks]
[*4 markah*]

CLO3
C3

QUESTION 3
Explain differences between personal monitoring and site monitoring.

SOALAN 3
Terangkan perbezaan antara permonitoran personal dengan pemonitoran kawasan.

[4 marks]
[*4 markah*]

CLO2
C2

QUESTION 4

Explain the functions of collimator in radiology imaging.

SOALAN 4

Terangkan fungsi kolimator dalam pengimejan radiologi

[4 marks]
[*4 markah*]

CLO1
C2

QUESTION 5

Explain the differences of technique in conventional and helical scanning in computer thermography

SOALAN 5

Terangkan perbezaan di antara teknik pengesan konvensional dan helical dalam termografi berkomputer

[4 marks]
[*4 markah*]

CLO2
C4

QUESTION 6

Explain the differences between pencil beam and fan beam technology in computed thermography.

SOALAN 6

Huraikan perbezaan antara teknologi pancaran pensil dan pancaran kipas dalam termografi berkomputer.

[4 marks]
[*4 markah*]

CLO1
C1

QUESTION 7

Draw the Bohr model atoms for sodium.

SOALAN 7

Lukiskan model Bohr untuk atom.

[4 marks]
[*4 markah*]

CLO2
C3

QUESTION 8

List **FOUR (4)** differences between radioisotopes used in diagnostic nuclear medicine and in therapeutic nuclear medicine

SOALAN 8

*Senaraikan **EMPAT (4)** perbezaan radioisotope yang digunakan dalam perubatan nuklear diagnostik dengan perubatan nuklear teraputik*

[4 marks]
[*4 markah*]

CLO1
C1

QUESTION 9

Describe what is meaning of the spin echo in Magnetic Resonance Imaging (MRI).

SOALAN 9

Terangkan apa yang dimaksudkan dengan spin echo dalam Magnetic Resonance Imaging (MRI).

[4 marks]
[*4 markah*]

CLO1
C3

QUESTION 10

Draw the Magnetic Resonance Imaging (MRI) system.

SOALAN 10

Lukis sistem MRI

[4 marks]
[*4 markah*]

SECTION B : 60 MARKS
BAHAGIAN B : 60 MARKAH

INSTRUCTION:
This section consists of **THREE (3)** essay questions. Answer **ALL** questions.

ARAHAN:
*Bahagian ini mengandungi **TIGA (3)** soalan esei. Jawab **SEMUA** soalan.*

QUESTION 1
SOALAN 1

There are many applications of non-ionizing radiation in our daily life. Two common examples of non-ionizing radiation in medical imaging are Ultrasound machine and Magnetic Resonance Imaging (MRI) machine.

Terdapat banyak aplikasi sinaran tak mengion dalam kehidupan harian kita. Dua contoh sinaran tak mengion dalam pengimejan perubatan adalah mesin Ultrasound dan mesin Magnetic Resonance Imaging (MRI).

CLO2
C4

(a) This question refers to the application of Ultrasound transducer. Calculate the total percentage of ultrasound reflection coefficient αR at transducer, received from different medium? (Ignore ultrasound absorption due to its movement from various matters or medium).

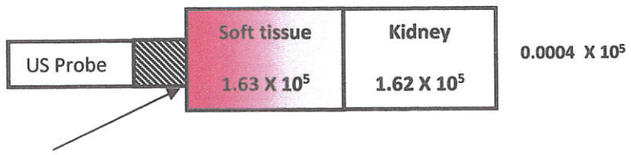

Figure 1

Given:

$$(Peratus\ Pekali\ Pantulan),\ \alpha_R = \left(\frac{Z_2 - Z_1}{Z_2 + Z_1}\right)^2 \times 100\%$$

The fraction of the incident energy that is transmitted across an interface is described by the transmission coefficient αT

$$where\ \alpha_T = \frac{4Z_1Z_2}{(Z_1 + Z_2)^2} \times 100\%$$

Z1 and Z2 are the acoustic impedances of the two media.

Table: 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 calculated where the density of the material is not known.

Material	Speeds (m/s)	Acoustic impedance g/cm²s
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

[10 marks]
[*10 markah*]

CLO1
C2

(b) The radio frequency (RF) system provides communication link with the patient's body for the purpose of producing an image in MRI system

Sistem Frekuensi radio (RF) memberikan hubungan komunikasi antara badan pesakit untuk menghasilkan imej dalam sistem MRI

i. Describe the functions of coil in MRI.
Terangkan kegunaan gegelung dalam MRI.

[4 marks]
[*4 markah*]

ii. Identify the advantages and disadvantage of MRI compared with other modality in medical imaging.
Kenalpasti kelebihan dan kekurangan MRI berbanding modaliti lain dalam pengimejan perubatan

[6 marks]
[*6 markah*]

QUESTION 2
SOALAN 2

CLO2 C2

(a) Describe briefly types of interactions produced radiation

Huraikan dengan jelas jenis hasil interaksi radiasi.

[4 marks]
[*4 markah*]

CLO2 C2

(b) X-ray machine is commonly used to diagnose a disease based on the acquired image. Describe briefly the differences between digital radiology rather than conventional radiology.

Mesin X-ray biasanya digunakan untuk mengesan penyakit berdasarkan imej yang diperolehi. Terangkan secara jelas perbezaan antara radiologi digital dengan radiologi konvensional

[4 marks]
[*4 markah*]

CLO2 C4

(c) Computed Tomography (CT) is a medical imaging tomography method created by computer processing.

Tomografi berkomputer (CT) adalah satu kaedah pengimejan perubatan tomografi yang dihasilkan oleh pemprosesan komputer.

i. Explain briefly Back Projection in CT scanner.
Terangkan secara ringkas unjuran belakang dalam pengimbas ct

[6 marks]
[*6 markah*]

ii. Identify **THREE (3)** types of CT scan machine generation.
*Kenalpasti **TIGA (3)** jenis genarasi mesin pengimbas ct*

[6 marks]
[*6 markah*]

QUESTION 3
SOALAN 3

CLO3 C3

(a) Explain clearly types of ray.
Terangkan dengan jelas jenis sinaran

[6 marks]
[*6 markah*]

CLO3 C3

(b) There is a variety of radiation used in radiological concept. List down the measurement units used by type of radiation
Terdapat pelbagai unit sinaran yang digunakan di dalam konsep radiologikal. Senaraikan unit ukuran yang digunakan mengikut jenis sinarannya

[6 marks]
[*6 markah*]

CLO3 C3

(c) Describe clearly **FOUR (4)** radiation detector types in radioisotope imaging.
*Huraikan dengan jelas **EMPAT (4)** jenis pengesan radiasi dalam pengimejan radioisotop*

[8 marks]
[*8 markah*]

SOALAN TAMAT