Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	PHYSICS OF DIAGNOSTIC RADIOLOGY
COURSE CODE	:	BWC 40803
PROGRAMME CODE	:	BWC
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) State is the ratio of energy converted into heat and energy converted into photon in the X-ray production.

(4 marks)

(b) Distinguish the effect of increasing the X-ray parameter between voltage and current on the continuum radiation.

(4 marks)

(c) The filament inside the X-ray tube is normally made from various type of elements such as tungsten, rhenium and molybdenum. Explain why this particular element is used as cathode material?

(6 marks)

(d) Two of X-ray tube are made from tungsten (W=74) and molybdenum (Mo=42).

(i) Determine which X-ray tube will produce higher intensity as both are applied with 100 keV of voltage.
(ii) Draw roughly the shape a continuum X-ray spectrum for both X-ray tube

(6 marks)

Q2 (a) Distinguish the function of the collimator and focusing cup in X-ray generator component.

(4 marks)

(b) Distinguish between stationary and rotating anode in X-ray tube.

(4 marks)

(c) Define the term of "anode heel effect" and explain in detail why this particular effect can reduce the X-ray intensity.

(6 marks)

(d) **Figure Q2(d)** show a graph of transmitted intensity versus thickness of absorber. Based on this graph, determine the

(i) material absorption coefficient, μ.
(ii) intensity of transmitted intensity at 16 cm.

(6 marks)

Q3 (a) There are **FIVE (5)** steps of quality control procedure in diagnostic radiology. List and explain in detail for each of them.

(5 marks)

(b) Define the term of X-ray tube rating charts and state the rule of using these charts.

(7 marks)

(c) (i) In a radiography process, 10 exposure has been done within 0.43 sec at X-ray setting of 80 kVp and 200 mA using high frequency X-ray unit. If the rectification constant, Cr for high frequency unit is 1.43, calculate the heat unit (HU) produced by this X-ray tube.

(ii) Anode cooling chart for **Q3(c)(i)** is shown in **Figure Q3(c)**. Determine how long does it take for this X-ray tube to operate for another exposure?

(8 marks)

Q4 (a) Classify the basic components for projection radiography system.

(4 marks)

(b) Explain in detail the image formation mechanism for the radiography projection system.

(6 marks)

(c) Explain in detail how X-ray Computed Tomography work.

(4 marks)

(d) There are four types of CT scanner generation. Differentiate the first and the fourth CT generation.

(6 marks)

Q5 (a) Latent image formation is different in conventional radiography (CR) and digital radiography (DR). Differentiate the mechanism of image formation between CR and DR.

(4 marks)

(b) In radiography imaging, there are two type of digital radiography (DR) imaging technique, which consists of indirect digital radiography and direct digital radiography. Differentiate the mechanism for both techniques.

(4 marks)

(c) Picture archiving and communication system (PACS) is a networking system to distribute the digital image in radiography. Draw a schematic diagram of this system and explain in detail how this system work.

(6 marks)

(d) The image resolution for various kind of radiography imaging technique is as shown in **Figure 5(d)**. Compare the resolution for each imaging techniques and suggest the best technique that give sharp and higher resolution image.

(6 marks)

-END OF THE QUESTIONS-

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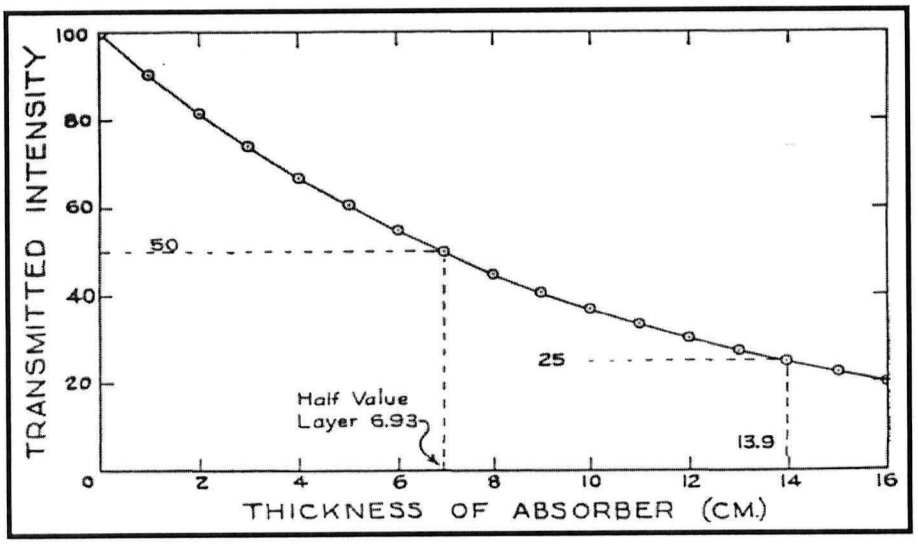

Figure Q2(d)

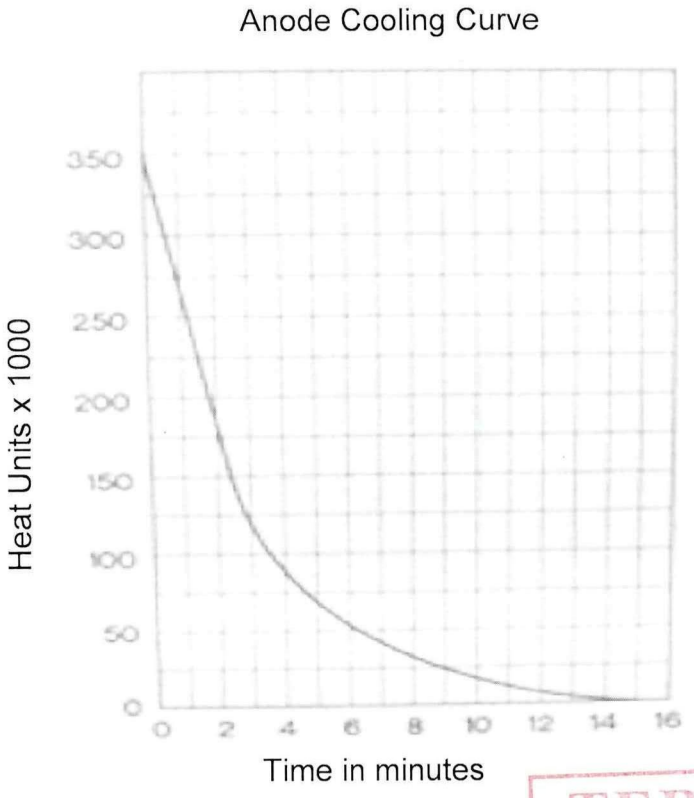

Figure Q3(c)

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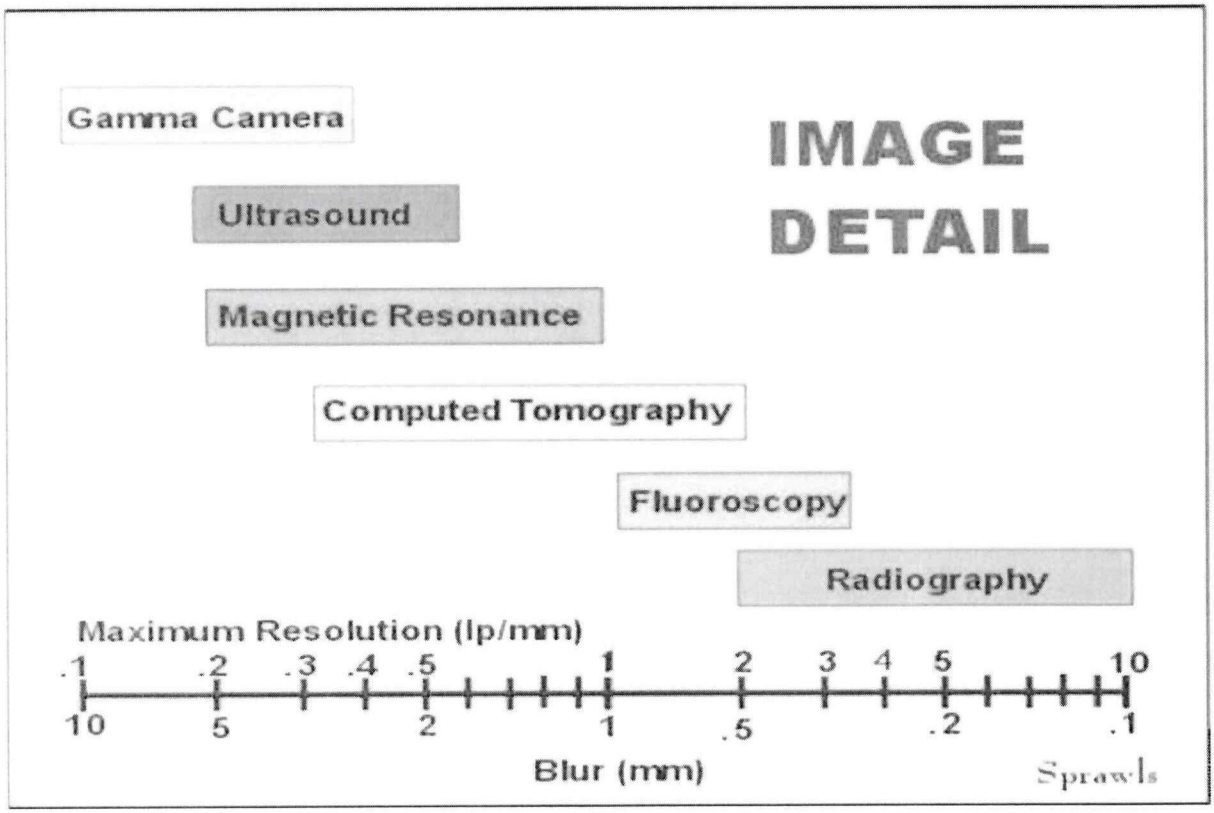

Figure Q5(d)