



UNIVERSITI KUALA LUMPUR
ROYAL COLLEGE OF MEDICINE PERAK

FINAL EXAMINATION
MARCH SEMESTER 2026

COURSE CODE : RXD32602
COURSE NAME : PHYSICS, INSTRUMENTATION AND TECHNIQUES OF
COMPUTED TOMOGRAPHY
PROGRAMME NAME : DIPLOMA IN MEDICAL IMAGING
DATE : 1 JULY 2026
TIME : 9.00 AM – 10.30 AM
DURATION : 1 HOUR 30 MINUTES

INSTRUCTIONS TO CANDIDATES

1. Please read CAREFULLY the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of TWO (2) section; Section A and Section B.
4. Answer ALL questions in Section A. For Section B, answer THREE (3) questions ONLY.
5. Please mark/write your answers on the OMR answer script or answer booklet provided.
6. Answer ALL questions in English language ONLY.

THERE ARE 5 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A: MULTIPLE OF CHOICE QUESTIONS (Total: 15 marks)

INSTRUCTION: Answer ALL questions.

Please use the objective answer sheet provided.

1. Identify the type of detector that can absorb 90% of x-rays in computed tomography (CT).
 - A. Gas-filled detectors with sodium iodide, (NaI)
 - B. Solid-state detectors with bismuth germinate ($\text{Bi}_4\text{Ge}_3\text{O}_{12}$)
 - C. Scintillation detectors with cadmium tungstate (CdWO_4)
 - D. Scintillation detectors with cesium iodide (CsI)
2. Identify the type of CT descriptor to estimate the total dose along the distance scanned.
 - A. Effective dose (E)
 - B. Dose length product (DLP)
 - C. Volume computed tomography dose index (CTDIvol)
 - D. Weighted computed tomography dose index (CTDIw)
3. Select the **CORRECT** statement regarding the pitch.
 - A. The lower the pitch, the higher the dose to the patient.
 - B. The higher the pitch, the higher the dose to the patient.
 - C. Faster scanning time requires lower pitch value, thus, higher dose to patient.
 - D. Slower scanning time requires lower pitch value, thus, higher dose to patients.
4. Identify the CT number of water.
 - A. 0
 - B. 100
 - C. 1000
 - D. - 1000
5. Recognise the method to improve the spatial resolution in the CT image.
 - A. Use the thicker slice thickness.
 - B. Use the larger field of view (FOV).
 - C. Use the filtered back projection reconstruction.
 - D. Use the edge enhancement reconstruction algorithm.

6. Select the **CORRECT** statement regarding the effect of slice thickness on the CT image.
- A. Thicker slice thickness produces image of low contrast, higher the partial volume artifact, so that poor image definition is produced.
 - B. Thinner slice thickness produces image of low contrast, higher the partial volume artifact, so that poor image definition is produced.
 - C. Thicker slice thickness produces image of high contrast, higher the partial volume artifact, so that poor image definition is produced.
 - D. Thinner slice thickness produces image of low contrast, lower the partial volume artifact, so that poor image definition is produced.
7. Identify the scan range for scout image of CT brain.
- A. From superior vertex to inferior xiphoid process.
 - B. From superior base of skull to inferior xiphoid process.
 - C. From superior base of skull to inferior menti of mandible.
 - D. From superior vertex of skull to inferior menti of mandible.
8. Calculate the amount of contrast volume if a patient weigh is 60kg by using 1.5mL/kg dose.
- A. 45mL
 - B. 60mL
 - C. 90mL
 - D. 120mL
9. Select the **CORRECT** part positioning for CT neck examination.
- A. The neck should be positioned laterally.
 - B. The neck should be positioned neutrally.
 - C. The neck should be positioned slightly hyperflexion.
 - D. The neck should be positioned slightly hyperextended.
10. Identify the scan range used for CT neck examination.
- A. Orbits to diaphragm
 - B. Mandible to sternum
 - C. Skull vertex to clavicle
 - D. Skull base to thoracic inlet

11. Select the **CORRECT** patient positioning technique for CT thorax examination.
- A. Ensure the ASIS are equal on both sides.
 - B. Ensure both shoulder and ASIS are equal.
 - C. Ensure the shoulders are equal on both sides.
 - D. Ensure the symphysis pubis aligned with mid-sagittal plane on both sides.
12. Select the **CORRECT** patient instruction during high resolution computed tomography (HRCT) of thorax to reduce motion artefacts.
- A. Hold breaths.
 - B. Take breaths and exhale.
 - C. Take deep breaths and hold.
 - D. Take deep breaths continuously.
13. Recognise the CT post-processing technique that reconstructs images into sagittal, coronal, and oblique plane from axial data.
- A. Volume Rendering (VR)
 - B. Surface Shaded Display (SSD)
 - C. Multiplanar Reconstruction (MPR)
 - D. Maximum Intensity Projection (MIP)
14. Recognise the types of contrast media used for CT abdomen and pelvis examination.
- A. Oral and rectal contrast.
 - B. Intravenous and oral contrast.
 - C. Intravenous, and rectal contrast.
 - D. Intravenous, oral and rectal contrast.
15. Identify the scan range for CT angiography (CTA) of cardiac examination.
- A. Lower border at carina, lower border 1 ½ inferior from apex of the heart shadow.
 - B. Upper border at carina, upper border 1 ½ inferior from apex of the heart shadow.
 - C. Upper border at carina, lower border 1 ½ superior from apex of the heart shadow.
 - D. Upper border at carina, lower border 1 ½ inferior from apex of the heart shadow.

SECTION B: MODIFIED ESSAY QUESTIONS (Total: 60 marks)

INSTRUCTION: This section consists of **FOUR (4)** modified essay questions (MEQ).

You are required to answer **ONLY THREE (3)** questions in the answer booklet provided.

Question 1

- (a) Describe the scanning protocols for computed tomography (CT) of brain examination.
(5 marks)
- (b) Interpret the corrective measures to minimise artefacts in CT examination.
(10 marks)
- (c) Calculate the pitch if the given width of slices is 10cm and distance of couch is 20cm.
(5 marks)

Question 2

- (a) Organise the procedure for CT thorax examination based on patient positioning.
(10 marks)
- (b) Describe the advantages of multi-slice helical computed tomography (MSCT).
(5 marks)
- (c) Calculate the dose length product (DLP) if the scan length is 20cm and the volume computed tomography dose index (CTDIvol) is 0.12 mGy.
(5 marks)

Question 3

- (a) Relate the CT image quality with the scan range, field of view (FOV), slice thickness, gantry tilt and kilovoltage peak (kVp) usage. (10 marks)
- (b) Describe the breathing technique for high resolution computed tomography (HRCT) of thorax examination. (5 marks)
- (c) Calculate the CTDIvol if a pitch is 1.5 and the weighted computed tomography dose index CTDIw is 0.18 mGy. (5 marks)

Question 4

- (a) Describe the positioning techniques for CT neck examination. (5 marks)
- (b) Classify the types of edge enhancement reconstruction algorithm used for CT examination. (10 marks)
- (c) Calculate the effective dose (E), if tissue weighting is 0.0031 and a DLP is 2.4 mGy.cm. (5 marks)

END OF EXAMINATION PAPER