

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I (2008 PROSPECTUS) EXAMINATION –
DECEMBER, 2017

ESSAY PAPER

Date : 5th December 2017

Time: 9.30 a.m. – 12.30 p.m.

Answer each question in a separate book.

Each part has four (04) questions, of which three (03) have to be answered.

Each question carries 100 marks.

PART A

PHYSICS APPARATUS, PHOTOGRAPHY AND FILM FAULTS

1.

- (a). Sketch a labeled typical graph of the energy spectrum of a Tungsten target X ray tube operated at 80 kVp. Indicate the values of K_{α} , K_{β} and maximum photon energy in the graph. (20 marks)
- (b). What is meant by inherent filtration and added filtration in radiography? (10 marks)
- (c). Why is the filtration essential in radiography? (10 marks)
- (d). Explain the influence of following parameters in film screen radiography.
 - (i) Tube voltage on subject contrast (15 marks)
 - (ii) Line focus principle on image quality (15 marks)
 - (iii) Heel effect on beam intensity (15marks)
 - (iv) Beam collimation on patient radiation dose (15 marks)

2.

- (a). Draw a labeled line diagram of an image intensifier tube used in fluoroscopy. (15 marks)
- (b). Briefly explain two reasons for using Cesium Iodide (CsI) mostly as the input phosphor screen in image intensifier tubes (20 marks)
- (c). Write down the main functions of the following components
- (i) Photo cathode (10 marks)
 - (ii) Electro static lenses (10 marks)
 - (iii) Output screen (10 marks)
- (d). Why should the image intensifier tube be placed as close as possible to the patient? (15 marks)
- (e). Explain two artifacts that may be produced by an image intensifier tube. (20 marks)

3.

- (a). Define the piezoelectric effect. (15 marks)
- (b). Draw a labeled line diagram of a single element ultrasound transducer. (20 marks)
- (c). Explain how the ultrasound transducer is designed to
- (i) generate ultrasound efficiently (20 marks)
 - (ii) transmit ultrasound efficiently to the patient (20 marks)
- (d). Define the quality factor (Q) of an ultrasound transducer (15 marks)
- (e). How does the ultrasound pulse vary with the quality factor? (10 marks)

4.

- (a). Explain the use of following in helical computed tomography (CT)
- (i) Slip ring technology (25 marks)
 - (ii) Interpolation of data (25 marks)
- (b). Define the CT number and explain why the linear attenuation coefficients are converted into CT numbers. (25 marks)
- (c). Explain how the windowing technique is used to improve the contrast of CT images. (25 marks)

PART B

RADIOLOGICAL ANATOMY AND RADIOGRAPHY

1.

- (a). Draw a labeled line diagram of a coronal section through the shoulder joint as seen on a T2W MR image. (MRI signal characteristics are not expected.) (50 marks)
- (b). A patient presents to the emergency department with a painful right shoulder after a fall.
Enumerate the plain radiographic views that can be used to assess the shoulder joint. (20 marks)
- (c). Briefly describe the radiography of two of the above views. (exposure parameters are not expected). (30 marks)

2.

- (a). Describe briefly the sonographic anatomy of the adult female breast. (30 marks)
- (b). Describe the technique of ultrasound and basic mammographic views of female breast, highlighting the advantages and disadvantages of each technique. (50 marks)
- (c). Do a brief comparison of film screen mammography and digital mammography. (20 marks)

- 3.
- (a). Draw and label the mid sagittal view of the brain as seen in T2W MRI using a line diagram (MRI signal characteristic are not expected). (50 marks)
 - (b). A patient presents to the emergency department with an acute stroke.
 - (i) List the different MRI sequences which can be used for assessment of this patient (20 marks)
 - (ii) Briefly describe the radiological value of each sequence in view of assessing the ischaemic event. (20 marks)
4. Describe radiological anatomy of
- (a). superficial and deep venous systems of the lower limb. (50 marks)
 - (b). thyroid gland with its immediate relationships. (50 marks)

PART C
TECHNIQUES, DRUGS AND CONTRAST MEDIA

- 1.
- (a). A 50 year old male patient presented to the accident service with a history of acute blunt trauma to the abdomen.
On physical examination he was found to be having a tender abdomen but haemodynamically stable.
Outline your imaging protocol of this patient within the first 24 hours? (20 marks)
 - (b). Describe the radiological investigations to demonstrate the presence of pneumoperitoneum mentioning the limitations/disadvantages of selected imaging techniques. (40 marks)
 - (c). Briefly describe the CT technique with appropriate protocol to demonstrate an acute traumatic pancreatic injury. (40 marks)

- 2.
- (a). Write a brief account on following used in upper gastro intestinal imaging.
- (i) Contrast media (30 marks)
 - (ii) Pharmacological agents (20 marks)
- (b). Describe how you would perform an upper gastro intestinal contrast study through a nasogastric tube in a three day old neonate with bilious vomiting. (50 marks)
3. Discuss the transrectal ultrasound guided biopsy of the prostate gland with regard to its preprocedural management, technique, complications and post procedural management. (100 marks)
4. (a). A patient presented with hepatomegaly and clinical suspicion of a focal liver mass.
Briefly discuss the radiological investigations to arrive at a diagnosis. (60 marks)
- (b). (i). What is contrast induced nephropathy (CIN). (10 marks)
- (ii). Describe the patient preparation of a diabetic patient awaiting a contrast CT study, having a persistent eGFR of $40 \text{ ml/min/1.73 m}^2$. (30 marks)