

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER 2012

ESSAY PAPER

Date : 4th December 2012

Time : 9.30 a.m. – 12.30 p.m.

Answer each part in a separate book, marked A, B and C.

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
(BOOK A)

1.

- (a) Describe the performance of photographic film when exposed to x-rays in terms of contrast, latitude, speed and base+fog (40 marks)
- (b) List the types of unsharpness in film screen radiography and state the methods that could be taken to minimize it: (40 marks)
- (c) What are the potential sources of film fog that may occur in a radiology department? (20 marks)

2.

- (a) Briefly explain the main interaction process that produce scattered radiation in diagnostic radiography. (20 marks)
- (b) Describe the advantages and disadvantages of using grids in radiography. (20 marks)
- (c) What are the possible situations which may produce grid cutoff? Explain how the corresponding cutoffs are seen on films. (40 marks)
- (d) Briefly explain four factors which influence the biological effects on humans due to ionizing radiation." (20 marks)

- 3.
- (a) Write down an equation for the frequency shift in Doppler ultrasound. Define the terms used in the equation. (10 marks)
 - (b) Explain the reasons for using Doppler angles in the range between 30° and 60° . (30 marks)
 - (c) Describe the data acquisition, processing and displaying the information in duplex ultrasound scanning. (60 marks)

- 4.
- (a) What is meant by free induction decay of magnetic resonance signal ? (20 marks)
 - (b) What are meant by spin-lattice relaxation time (T1) and spin-spin relaxation time (T2)?
What are the causes of these relaxations? (20 marks)
 - (c) Using suitable graphs explain how imaging parameters are selected to obtain T1 weighted, T2 weighted and proton density images in spin echo magnetic resonance imaging. (60 marks)

PART B

RADIOLOGICAL ANATOMY AND RADIOGRAPHY (BOOK B)

1.
 - (a) Draw a labeled line diagram of T-1 weighted coronal Magnetic Resonance Image of the brain at the level of head of hippocampus. (70 marks)
 - (b) A patient is sent to you with the clinical diagnosis of temporal lobe epilepsy. Enumerate imaging modalities available to investigate this patient's hippocampal region. (30 marks)

2.
 - (a) Describe the features in frontal chest Radiographs which are helpful in identifying the thymus in a four year old child. (20 marks)
 - (b) Enumerate the anatomical relations of the thymus. (30 marks)
 - (c) Discuss the appearance of the thymus as seen on Ultrasonography, Computed Tomography and Magnetic Resonance Imaging. (50 marks)

3.
 - (a) Describe Ultrasonographic anatomy of the normal, adult, non gravid uterus. (60 marks)
 - (b) Compare and contrast transvaginal sonography with Magnetic Resonance Imaging in radiological evaluation of uterus. (40 marks)

4. A 27 year old National Rugby player was brought to radiology department with pain and swelling around the right knee joint, immediately after a match.
 - (a) Describe briefly the initial plain X-ray views needed to evaluate this patient and give your reasons for selecting them (details of radiographic technique are not required). (50 marks)
 - (b) Describe briefly the other imaging modalities useful in evaluating this patient's injury. (50 marks)

PART C

RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS (BOOK C)

1. A request is made for a superior mesenteric catheter angiography for a 50 years old patient.

Describe your technique (including patient preparation) of this procedure via femoral puncture. (Description of complications is not expected).

(100 marks)

2.

- (a) Describe your technique of double contrast barium meal in a patient suspected of having a peptic ulcer. (70 marks)

- (a) What are your modifications to the routine double contrast barium meal in following conditions?

(i) Infant with suspected intestinal malrotation. (15 marks)

(ii) Neonate with suspected pyloric stenosis. (15 marks)

3. A 50 year old female presented with pain and restricted movements of the right shoulder.

- (a) Enumerate the radiological investigations available to evaluate this patient (20 marks)

- (b) Describe the sonographic technique of shoulder joint in this patient. (80 marks)

4. Write an account on the following.

(a) Ultrasound contrast media. (50 marks)

(b) Gastrointestinal MRI contrast media. (50 marks)

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MD (RADIOLOGY) PART I EXAMINATION
DECEMBER 2013

ESSAY PAPER

Date : 3rd December 2013

Time : 9.30 a.m. – 12.30 p.m.

Ansr each part in a separate book, marked A, B and C.

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
(BOOK A)**

1.

- (a) Briefly explain the followings in radiography using simple diagrams
 - (i) position of the object displacement in the image (position distortion) (20 marks)
 - (ii) foreshortening of the image size (shape distortion) (20 marks)
- (b). Describe the advantages and disadvantages of computed radiography system with compared to the film-screen radiography system. (30 marks)
- (c) Explain the reasons for using higher kVp, longer SID (source image distance) and short exposure times in chest radiography. (30 marks)

2.

- (a) How do the sensitivity and spatial resolution of a gamma camera vary when
 - (i) the parallel hole collimator to object distance increases? (10 marks)
 - (ii) a high energy radionuclide is used with a suitable collimator? (10 marks)
- (b)
 - (i) List four (04) radionuclides used in PET scanning with their half-lives. (20 marks)
 - (ii) Discuss three (03) differences in physical properties of radionuclides used for PET imaging compared to gamma camera imaging. (20 marks)
- (c) Briefly explain the procedure used for the management of low level radioactive wastes generated in a nuclear medicine department. (40 marks)

3.

- (a) Explain the spatial resolution in ultrasound imaging. (45 marks)
- (b) Explain the different methods used in ultrasound scanners to improve the spatial resolution. (30 marks)
- (c) Explain why the spatial resolution of the colour region is lower than that of the gray scale region in colour Doppler ultrasound. (25 marks)

4.

- (a) List five (05) factors that influence the appearance of blood vessels on Magnetic Resonance Images. (20 marks)
- (d) Giving the reasons, explain the appearance of blood vessels in
 - (i) Spin echo (SE) sequence (25 marks)
 - (ii) Gradient recalled echo (GRE) sequence (25 marks)
- (c) Explain why GRE images are T2* weighted and SE images are T2 weighted. (30 marks)

PART B

RADIOLOGICAL ANATOMY AND RADIOGRAPHY (BOOK B)

1.
 - (a) Draw a labeled line diagram of the cerebral veins as seen on the lateral view of the venous phase of the digital subtraction carotid angiogram. (60 marks)
 - (b) Discuss the advantages and disadvantages of Computed Tomographic (CT) venography compared to Magnetic Resonance (MR) venography in evaluation of cerebral veins. (40 marks)
2. Describe radiological anatomy of the right ureter. (100 marks)
3.
 - (a) Draw a labeled line diagram of axial T1W Magnetic Resonance (MRI) section of larynx at the level of glottis. (50 marks)
 - (b) Compare imaging features of glottis with supraglottic and infraglottic regions as seen in T1W MRI (50 marks)
4. Discuss your instructions to the radiographer regarding plain radiographic evaluation of following suspected clinical conditions (details of radiographic techniques are not required).
 - (a) Foreign body aspiration in a one year old child. (25 marks)
 - (b) Slipped left capital femoral epiphysis in a ten year old child (25 marks)
 - (c) Posterior dislocation of the right shoulder joint in a 40year old man following convulsions. (25 marks)
 - (d) Perforated peptic ulcer in a seventy year old bed ridden woman . (25 marks)

PART C

**RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(BOOK C)**

1.
 - (a) Enumerate the radiological investigations available to assess small bowel. (30 marks)
 - (b) Write a brief account on Computed Tomographic (CT) enterography (70 marks)

2. A new born child with ambiguous genitalia is referred to you for sonography, with the view of gender assignment.
 - (a) Describe in detail your sonographic technique (90 marks)
 - (b) Enumerate other radiological investigations which are helpful in gender assignment. (10 marks)

3.
 - (a) Describe your patient preparation and protocol for Computed Tomographic coronary angiography (60 marks)
 - (b) Compare and contrast catheter coronary angiography with CT coronary angiography (40 marks)

4. Discuss the patient preparation and precautions taken by you to minimize adverse effects of iodinated intravenous contrast media in
 - (a) an infant (20 marks)
 - (b) a patient with multiple myeloma (20 marks)
 - (c) a patient with previous severe reaction to iodinated intravenous contrast media (25 marks)
 - (d) a diabetic patient on metformin (35 marks)

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER 2014

ESSAY PAPER

Date : 2nd December 2014

Time : 9.30 a.m. – 12.30 p.m.

Answer each part in a separate book, marked A, B and C.

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
(BOOK A)

1.
 - (a) Describe the photoelectric effect which contributes to the image formation in diagnostic radiography. (30 marks)
 - (b) Explain how the relative probability of occurrence of above process depends on x-ray energy and body composition. (20 marks)
 - (c) What are the reasons for using molybdenum targets and molybdenum filters in mammography? (20 marks)
 - (d) Explain the Line Focus Principle and state the advantages of this principle in diagnostic radiography. (30 marks)

2.
 - (a) Using a labeled diagram explain the function of a photomultiplier tube attached to the head of a gamma camera. (30 marks)
 - (b) What is the main source of noise in gamma camera images and explain the relationship of it to the patient dose. (20 marks)
 - (c) Briefly explain how the scattered radiation is rejected in the gamma camera. (20 marks)
 - (d) Briefly explain the stochastic effect and deterministic effect of ionizing radiation providing an example for each. (30 marks)

3.

- (a) Briefly explain how harmonics are produced in ultrasound imaging. (40 marks)
- (b) Describe the "harmonic band filtering" and "pulse inversion" methods used in ultrasound harmonic imaging. (40 marks)
- (c) List four (4) advantages of ultrasound harmonic imaging? (20 marks)

4.

- (a) List three (3) types of scintillating materials used in multi slice CT scanners'. Describe how these detectors are arranged in the scanner. (25 marks)
- (b) Explain how different slice thicknesses are obtained in multi slice CT scanners. (25 marks)
- (c) Explain why interpolation of data is needed before image reconstruction in helical scanning. (25 marks)
- (d) What are the reasons for using windowing process during the display of CT images ? (25 marks)

PART B

RADIOLOGICAL ANATOMY AND RADIOTHERAPY (BOOK B)

1.
 - (a) Mention the various ages at which the paranasal sinuses develop
(20 marks)
 - (b) Draw a labeled line diagram of coronal computed tomography (CT) section of paranasal sinuses at the level of the ostiomeatal unit (soft tissue details are not required)
(50 marks)
 - (c) What are
 - i) Agger nasi cells
 - ii) Haller cells
 - iii) Concha bullosa
(30 marks)

2.
 - (a) Describe briefly the development of the pancreas and the pancreatic duct system
(30 marks)
 - (b) Draw a labeled line diagram of the normal pancreatico - biliary duct system as seen in Magnetic Resonance Cholangiopancreatogram (MRCP)
(40 marks)
 - (c) Write short notes on
 - i) pancreatic divisum
 - ii) Annular pancreas
(30 marks)

3.
 - (a) Enumerate the bony attachments of
 - i) Anterior cruciate ligament
 - ii) Posterior cruciate ligament of knee joint
(20 marks)
 - (b) Write a brief account on anatomy of medial meniscus of the knee joint with special reference to its appearance in magnetic resonance imaging (MRI)
(50 marks)
 - (c) How would you identify discoid meniscus in magnetic resonance imaging (MRI) of the knee ?
(30 marks)

4.

- (a) A 1 yr old boy is brought to your radiology department with a history of swallowing a coin lhr before. Discuss briefly the immediate and follow up protocol of plain x -ray evaluation of this child (40 marks)

- (b) Describe the plain X -ray technique of orbits ,to exclude a metallic foreign body in eye of a patient awaiting MRI examination of the head (20 marks)

- (c) Discuss the technical factors in plain film radiography, relevant in identifying a foreign body embedded in soft tissues. (40 marks)

PART C
RADIOLOGICAL TECHNIQUE, CONTRAST MEDIA AND DRUGS
(BOOK C)

1.
 - (a) Describe your technique of Doppler sonography of extra-cranial carotid arteries. (60 marks)
 - (b) What are the grey scale and Doppler sonographic features helpful in differentiating internal from external carotid artery? (40 marks)

2.
 - (a) What are the fundamental technical factors helpful in achieving high spatial resolution in High Resolution Computed Tomography (HR CT) of lungs? (40 marks)
 - (b) Discuss the usefulness of
 - i) Prone images
 - ii) Expiratory images in High Resolution Computed Tomography (HR CT) of lungs. (60 marks)

3. Write an account on Computed Tomographic Colonography under following headings.
 - (a) Patient preparation, technique of Computed Tomographic Colonography and effects of patient preparation on interpretation. (60 marks)
 - (b) Advantages and disadvantages of Computed Tomographic Colonography compared to Optical Colonoscopy. (40 marks)

4. Describe briefly the **patient preparation and technique of**
 - (a) Tru-cut (core) biopsy of a focal liver lesion. (50 marks)
 - (b) Trans-Rectal Ultrasound (TRUS) guided biopsy of prostate (50 marks)