POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
JANUARY, 1990

Date: 22nd January 1990 Time: 2.00 p.m. - 5.00 p.m.

ESSAY PAPER

Answer each part in a separate book, marked A, B and C.
Each part has FOUR questions, of which THREE have to be answered.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1. Describe the underlying principles in the construction and operation of a CT Scanner Unit.

2. Define the terms stochastic and non-stochastic effects and list the examples of each caused by ionizing radiations. Describe briefly the methods used to minimize these effects in diagnostic radiology.

3. What is the importance of KV, focal spot size, beam collimation and beam alignment on radiographic image quality.

4. Discuss the principles governing the production of clinical images using magnetic resonance.

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book B)

5. Describe the anatomical features of the menisci and the cruciate ligaments of the knee.

6. Describe the formation and distribution of cerebro-spinal fluid (C.S.P.) in the nervous system.

7. Describe the anatomy of the normal uterus and Fallopian tubes in a 25-year-old female.
   How do the appearances change on MR imaging during the menstrual cycle?

8. Describe the radiography of a patient with suspected injury of the cervical spine.

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C).

9. Describe the preparation of a patient who is to undergo a CT examination of the abdomen because of a GI problem.

10. What contrast media might you use in myelography? What precautions would you take ?

11. What techniques would you use in the investigation of a patient suspected of having enlarged hilar lymph glands.

12. Describe the detection and localization of intra-ocular foreign bodies.

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXKMINATION
SEPTEMBER, 1990

Date: 25th September 1990 Time: 2.00 p.m. –5.00 p.m.

ESSAY PAPER

Answer each part in a separate book, marked A, B and C. Each part has FOUR questions of which THREE have to be answered.

PART A
PHYSICS APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1. Why is personnel monitoring necessary in a diagnostic radiology department. Discuss how different monitoring methods meet these requirements.

2. Discuss how different types of grids influence the radiographic image quality.

3. Discuss the possible causes in a faulty processing unit that may lead to sudden changes in contrast.

4. Describe how various components of the gamma camera affect the resolution of the final image.

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book B)

5. Illustrate with diagrams the radiological anatomy of the cardiac chambers and valves.

6. Discuss the advantages of the high KV technique in chest radiography.

7. Draw a labeled diagram of a transverse section through the abdomen, at the level of the first lumbar vertebra.

8. Describe the radiographic-examination of a patient who has injured his right shoulder and cannot abduct the arm.

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C)

9. A patient with arterial disease has no femoral pulses;
Describe the available techniques for lower limb arteriography in this case.

10. Detail your ideal barium preparation for the radiological examination of;

(a) Oesophagus
(b) Stomach and Duodenum
(c) Jejunum and ileum
(d) Colon

11. Discuss the radiological investigation of a renal mass.

12. Describe the radiological investigation of a suspected posterior cranial fossa tumor.

POSTGRADUATE INSTITUTE OF MEDICINE
UNVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
OCTOBER, 1991

Date: 21st October 1991 Time: 2.00 p.m.- 5.00 p.m.

ESSAY PAPER

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.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book- A)

1. What is the physical basis of magnetic resonance imaging (MRI)?
   How are contrast and resolution controlled in MRI as compared with CT?

2. What is the usefulness of the characteristic curve of a film? Discuss the possible causes for any changes in the characteristic curve of a batch of films during routine use.

3. Discuss how different image recording and display systems in diagnostic radiology influence the patient dose.

4. Discuss the physical basis involved in Doppler methods of ultrasound. Explain briefly the use of Doppler in

   (a) the detection of fetal heart beats

   And

   (b) blood flow imaging

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book - B)

5. Give a brief description or diagram of the scaphoid bone and its articulations. Discuss the radiological investigation of suspected scaphoid fracture.

6. Describe the anatomy of the paranasal air sinuses. List the plain radiographs you advise in the investigation of sinusitis.

7. Draw a clearly labeled diagram of a transverse section through the mediastinum at the level of the pulmonary trunk (the lower part of the body of the5th thoracic vertebra).

8. Describe your technique for the plain radiography of the lumbar spine.

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C)

9. Indicate and justify your preferred policy for the use of low osmolar water-soluble contrast media in radiological investigation.

10. Describe the radiological techniques available to demonstrate the internal auditory meati.

11. Give your technique for intravenous digital subtraction arteriography of the abdominal aorta. What are the contraindications to this technique?

12. Describe the radiological investigation of the biliary system in a patient suspected of gallstones.

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER. 1992

Date: 7th December 1992 Time: 2.00 p.m.-5.00 p.m.

ESSAY PAPER

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.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1. List the features of Tc-99m, which make it such a useful radionuclide for medical imaging. How may the radiation dose to the patient he estimated from an injection of a radiopharmaceutical?

2. How is scattered radiation produced and how can its effects be minimized in diagnostic radiography.

3. Describe the fundamental differences between the features of the x-ray tubes and the x-ray spectra produced from each tube type used for mammography, conventional radiography and CT

4. Describe with the help of a diagram how an image intensifier works. What are the important parameters of an image intensifier when used in a digital fluoroscopy system?

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book B)

5. Describe the course and relations of the inferior vena cava. Enumerate its tributaries.

6. Discuss the radiographic examination of a possible subluxation of the atlanto axial joint.

7. Describe with aid of a diagram the anatomy of the extra hepatic biliary system. Indicate any anatomical variants you know of. Which is your technique for plain film radiography in a case of suspected gallstones.

8. Give the anatomy of the hip joint and indicate your technique for plain film radiography in suspected fracture of the femoral neck.

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C)

9. Indicate the contrast agents and adjuvant drugs, which may be used for barium enema examination. What are the risks of barium enema.

10. Discuss the risk of ultrasonography in the evaluation of arterial and venous disease, giving brief technical details.

11. A patient referred for an examination involving intra-vascular contrast medium has a history of an adverse reaction to such a drug. Indicate your policy in this situation.

12. Describe the radiological methods used to examinethe larynx.

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
AUGUST, 1993

Date: 9th August 1993 Time: 2.00 p.m. - 5.00 p.m.

ESSAY PAPER

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.

PART A - PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS (Book A)

1. Explain the difference between the quantities "absorbed dose" and "effective dose equivalent".

   Describe the influence of the various exposure parameters in diagnostic radiology on the effective dose equivalent to the patient.

   What x-ray examination details need to be recorded to enable a dose analysis to be made ?

2. Compare and contrast the use of radiographic grids in radiology with the use of collimators in nuclear medicine. Give examples of their uses.

3. Describe a quality assurance program for film processing in the radiology department giving examples of the causes and effects of film processing faults.

4. Explain the terms "near field" and "far field" for an ultrasound beam.
   What methods are available to modify the shape of the beam from a single crystal transducer ?

   How do such modifications affect the image?

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book B)

5. Draw a labeled diagram of an axial section of the brain at the level of the internal capsule.

6. Describe the anatomy of the uterus and its relations relevant to imaging techniques.

7. Describe the plain radiographic techniques, which are of value in demonstrating

   (a) cervicothoracic junction
   (b) the ankle

8. Give the anatomy of the shoulder joint and indicate your technique for plain film radiograph in suspected dislocation of the shoulder.

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C)

9. Describe with the aid of diagrams the radiological anatomy of the stomach and your technique for performing a barium meal.

10. Describe how you would carry out and ultrasonic examination of the pancreas. Discuss the difficulties, which may been countered and your techniques to overcome them.

11. Describe the clinical signs and symptoms of reaction to iodinated contrast agents. How would you treat an anaphylactic reaction?

12. Which drugs and contrast media are used to extend the diagnostic usefulness of computed tomography? Indicate their mode of administration and the reasons for use.

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER, 1994

Date: 12th December 1994 Time: 2.00 p.m. - 5.00 p.m.

ESSAY PAPER

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.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1. Explain the causes of unsharpness in plain film radiography, and state how it can be minimized. How would you measure there solution of a screen film system ?

2. What is a K-absorption edge ? Discuss how this phenomenon is useful in different radiographic imaging techniques.

3. Draw a labeled diagram of a gamma camera, briefly explaining the purpose of each component. What factors affect camera sensitivity ?

4. Describe the different types of biological effects, which can be caused by diagnostic x-rays. How would you minimize the risks to patients undergoing fluoroscopic examinations ?

PART B
RADIOLOGICAL ANATOMY, AND RADIOGRAPHY
(Book B)

5. Describe with the aid of diagrams the anatomy of the female breast and the radiographic technique used in mammography.

6. Describe the radiographic technique you would use to examine a patient with

   a. Fractured mandible.
   b. Fracture of the femoral neck.
   c. Suspected fracture of the cervical spine.

7. Describe with the aid of diagrams the radiological anatomy of :

   a. The coronary circulation.
   b. The biliary tree.
   c. The bronchial tree (AP view)

8. Describe briefly the radiological anatomy of the knee joint. Enumerate the imaging techniques used for its investigation.

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND RADIOGRAPHY
(Book C)

9. Describe your standard technique for performing a barium enema and any variations you may employ under particular clinical circumstances. Discuss the contra-indications and possible side effects of the technique.

10. Discuss the advantages and disadvantages of low osmolar contrast agents. What are the main indications for their use?

11. Describe your technique for performing an ultrasound examination of the infant brain. Enumerate the indications.

12. Discuss the indications for and the technique you use for Hysterosalpingography. Include patient preparation, after care and complications in your answer.

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER, 1995

Date: 11th December 1995 Time: 2.00 p.m. - 5.00 p.m.

ESSAY PAPER

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.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1. Describe what is meant by stochastic and non-stochastic events in relation to the biological harm ionizing radiation can cause.

   How are these events each related to the absorbed radiation dose ?

   What measures would you adopt in a diagnostic imaging department to apply the ALARA principle for patient investigations?

2. Describe the spin echo sequence in MR.
   How can T1 weighted and T2 weighted images is generated using this sequence?

3. Describe with the help of a diagram how a CT scanner works.
   What do you understand by beam hardening in CT scanning?
   Discuss briefly the effects of beam hardening on CT image.

4. Describe a quality assurance program with reasons you would carry out to monitor the performance of a film Processor.
   How would you judge the efficacy of this program?

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book B)

5. Describe with the aid of diagrams the cross sectional anatomy at the level of
   a. The pancreas
   b. The 3rd ventricle of brain

6. Describe with the aid of diagrams the radiological anatomy of the veins of the lower limb and pelvis and your technique for performing lower limb venography.

7. Describe the "plain" radiographic technique for examining :
   a. The scaphoid
   b. The sacroiliac joints

8. Describe how you would x-ray a patient with a suspected
   a. Dislocated shoulder
   b. Fractured neck of femur
   c. Fracture of C2

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C)

9. Describe your standard technique for performing an intravenous urogram examination and any variations you may employ under particular clinical circumstances.
   Discuss the contraindications and possible side effects of this technique.

10. Discuss the indications for and the technique you use for a Radionuclide bone scan.

11. Write short notes on the following

    a. Barium enema examination in a child suspected of Hirschsprung's disease.
    b. Percutaneous lung biopsy

12. Discuss general complications of intravascular catheter techniques.

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER, 1996

Date: 9th December1996 Time: 2.00 p.m. - 5.00 p.m.

ESSAY PAPER

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.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1. Describe with the aid of a simple diagram, the essential component of a gamma camera.

   How is scatter controlled in the imaging process ?
   Outline what daily quality assurance should be performed prior to imaging.

2. With the aid of diagrams, describe the inversion recovery sequence in MRI.
   How can this sequence be used to suppress the fat signal in an image?
   What basic quality assurance should be undertaken in MRI prior to imaging on a daily basis ?

3. Describe briefly the thermoluminescence detection system for measuring radiation dose.
   What work place monitoring and personnel monitoring would you advise in a Nuclear Medicine Department and why ?

4. Describe the physical processes of interaction of a x-ray beam with matter.
   What is K-edge absorption and how is this used in radiography ?

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book B)

5. Describe with the use of illustrations the anatomy of the knee joint. What methods of investigations are available for assessment?

6. Describe with the aid of diagrams the radiography and anatomy of standard lateral, postero-anterior and Townes views of the skull.

7. Describe with the aid of diagrams the normal abdominal aorta and its branches.

8. Describe with the aid of diagrams the radiography of
   (a) The wrist
   (b) The calcaneum
   (c) The abdomen

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C)

9. Discuss the indications and contraindications for a small bowel follow through examination. Describe your technique for the procedure.

10. Discuss the indications for an intravenous urogram. Describe your technique what complications may arise?

11. Describe the methods of investigation available to assess the lumbar spine.

12. Describe the anatomy of the shoulder joint and include methods of investigation.

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER, 1997

Date: 8th December 1997 Time: 2.00 p.m. - 5.00 p.m.

ESSAY PAPER

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.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1. Explain the terms absorbed dose and effective dose equivalent (equivalent dose) stating the units for each parameter.
   Explain what measures might be taken in a room where fluoroscopy is undertaken to reduce the radiation dose to staff.
   What are the relevant doses limits for staff working with fluoroscopic techniques?

2. What do you understand by the term 'overall spatial resolution of a gamma camera head' and how would this parameter be measured?
   What factors affect the spatial resolution of a gamma camera?

3. Draw a labeled diagram of an X-ray tube, identifying essential components.
   Show the typical output spectrum from a tungsten anode tube operating at 95 kvp and describe the physical processes involved in the formation of the energy spectrum.

   How is characteristic radiation used in mammographic techniques?

4. Describe how magnetic field gradients and radio frequencies are used in the imaging process for MRI.

   What are the hazards associated with MRI and what precautions would you implement to ensure the safety of staff, public and patients ?

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book -B)

1. Draw a labeled diagram of the retroperitoneum including fascial planes. Describe the radiological investigation of a pancreatic head mass.

2. Discuss the plain radiography of imaging
   a. The knee joint
   b. The atlanto axial joint

3. Describe with the aid of diagrams the anatomy of the eye. Describe in detail the CT technique that you would use to image the optic nerve.

4. Compare the techniques available for ultrasound examination of the uterus and describe the relevant anatomy.

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book - C)

1. Write short notes on the technique of
   a. External biliary drainage
   b. DTPA renal scan

2. Enumerate the imaging modalities available for breast. State the current modality of choice in breast imaging and discuss its principles and technique.

3. Describe the radiological methods used in imaging of the lumbar spine.

4. Discuss the use of the following in radiology
   a. Non ionic low osmolar contrast media
   b. Buscopan
   c. Gadolinium

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER - 1998

Date: 7th December 1998 Time: 2.00 p.m. - 5.00 p.m.

ESSAY PAPER

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.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1. What are the three principles of radiation protection described by the International Commission on Radiological Protection (ICRP)?
   Describe how these may be implemented in a radiology department.

2. Describe the physical interactions, which take place when a beam of diagnostic ultrasound interacts with human tissues. Describe how the beam of ultrasound is focussed when it is produced by a linear array transducer, and how the received signal is processed to produce a uniform intensity on a B-Scan display for echoes produced at varying depths within a uniform tissue equivalent medium.

3. Describe the principles of operation of a 3rd generation computed tomography (CT) scanner.
   State which type of detectors are normally used in modern scanners and explain how the noise in the image is affected by operating parameters such as tube current, scan time, pixel size and slice thickness.

4. Give an account of acceptance tests, with reasons, that should be carried out on newly installed fluoroscopy x-ray unit, before releasing it for clinical use.

PART B
RADIOIDGICAL ANATOMY AND RADIOGRAPHY
(Book - B)

1. Describe with technical detail the radiological investigations available for the examination of the oesophagus.
   (a) List the methods of examination of the pancreas
   (b) Describe the radiological anatomy of the pancreas

3. A patient was brought to the x-ray department with suspected cervical spine injury

   (a) State 4 radiographic projections, which you consider as useful in the investigation of this patient

   (b) Describe the radiography of the above projections

4.

   (a) Describe with the aid of diagrams the normal aortic arch and it's branches

   (b) Discuss the common normal variations

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book - C)

1.

   (a) List the imaging modalities used commonly for the lungs
   (b) Discuss the relative advantages and disadvantages of each modality

2. A patient referred for an examination involving intravenous contrast medium has a history of an adverse reaction to such a drug.
   Discuss how you would sort out the problem in this situation

3. Write short notes on the following :
   (a) Imaging of the posterior fossa of the brain
   (b) Percutaneous nephrostomy

4.

   (a) List the imaging modalities available for the hip joint

   (b) Discuss one of the imaging modalities in detail giving it's advantages and limitations

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER, 1999

Date: 6th December 1999 Time: 2.00p.m. -5.00p.m.

ESSAY PAPER

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.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1. Describe the physical processes that may take place when a beam of diagnostic x-rays interacts with human tissues.
   State which processes are most important in the production of diagnostic images for mammography and computed tomography (CT)?
   Give details of how the proportion of scattered radiation reaching the film may be minimized in routine diagnostic radiography.

2. What do you understand by the terms Contrast, Unsharpness, Mottle and Fog as applied to a radiographic image ?
   Explain how these quantities are affected by Kvp, mAs, focal spot size and film developing conditions.

3. Draw a simple diagram illustrating how radioactive Technitium - 99m is produced in a hospital radiopharmacy for use in scanning nuclear medicine patients.
   Show graphically how the activity changes with time if the generator is eluted daily over a period of I week, and state upon what factors the growth or decay of total activity depends.
   What advice would you give to a lactating woman who are administered Tc- 99m for a bone scan ?
   Explain your answer with reasons.

4. With the aid of a diagram explain the principle of operation of an image intensifier. Show how this may be included in a digital imaging system and describe the functions of each component of the system.
   What are the sources of noise in DSA and explain briefly how noise is controlled.

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book B)

1. Draw labeled diagrams of the internal structure and relationships of the right kidney, with regard to ultrasound and CT.

2.
   (a) Enumerate the imaging modalities available for examination of the Common Bile duct.

   (b) Briefly mention radiological anatomy in each modality.

3.
   (a) Describe the technique of plain radiography of the wrist.
   (b) State the other methods of investigation that you might use giving one advantage of each.

4. Give a brief account of the techniques of plain chest radiography (excluding Tomography)

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C)

1. Describe in detail how you would perform a parotid Sialogram including the indications, equipment, technique and complications.

2. Describe the technique of double contrast Barium enema examination.

3. Discuss the fundamental features of
   (a) Thyroid scintigraphy.
   (b) Percutaneous Lung biopsy.

4. Discuss briefly the current use of contrast media in the central nervous system.

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
JULY -2000

Date: 17th July 2000 Time: 2.00 p.m. - 5.00 p.m.

ESSAY PAPER

Answer each part in a separate book, marked A, B, and C.
Each part has FOUR (4) questions, of which THREE (3) have to be answered.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1. Define the term of radiation Dose (Absorbed Dose) and state the unit used in its measurement
   Explain the terms Stochastic and Non-Stochastic (Deterministic) as applied to the effects of ionizing radiation on human tissues, and how knowledge of these effects is used to define Effective Dose.
   Describe what measures are taken in a radiology department to minimize risks to a possible foetus when examining female patients.

2. Draw a graph with labeled axes showing the spectrum of x-rays produced by Tungsten target x-ray tube operated at 100 kvp and with an inherent filtration of 1-mm Aluminum.

   Indicate on your graph how the spectrum would be changed by the addition of:

   a) 2.5 mm Aluminum,
   b) 0.5 mm Copper

   Explain the effects of increasing filtration on patient dose and x-ray tube loading, and explain in what circumstances higher atomic number materials such as copper might be used.

3. Describe how the principles of x-ray attenuation in tissue in a CT scanner.
   Define the terms Houndsfield Unit, Window Level and Window Width and explain with the aid of diagrams how differences in tissue density are displayed on the monitor of a CT scanner
   State what technical developments have enabled spiral CT Scanners and explain the term 'Pitch' and how pitch affects patient dose.

4. Describe how a Magnetic Resonance Image (MRI) of tissues is produced using an inverse- recovery pulse sequence. What effect does an injection of Gadolinium DTPA have on a TI weighted image.
Describe the principle of operation of the 'Faraday Cage' and state its purpose in MRI
Name and briefly describe the four major hazards associated with use of MRI scanners and what precautions should be taken to ensure the safety of staff working in its vicinity.

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book B)

1.
   a) Draw a labeled diagram of the liver as seen on an axial image taken at the level of the porta hepatis.
   b) Briefly describe the CT anatomy of the liver

2. Describe the radiological anatomy of the left supra renal gland with regard to ultrasound and CT.

3. Describe the technique of plain radiography of the hip joint.

4. Draw labeled coronal and sagittal diagrams of neonatal brain at the transthalamic plane, as seen on Ultrasonography.
State advantages and disadvantages of this imaging modality

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C)

1. Describe the technique of IVU in a patient with suspected renal mass.
What are the limitations of this technique?

2. List the techniques available for imaging the breast.
Briefly indicate how each is employed in the investigation of the breast. (Details of the techniques are not required)

3.
   a) What are the contrast media used in the imaging of gastrointestinal tract.

   b) Discuss your selection of ideal contrast medium for the imaging of
      i. Oesophagus
      ii. Stomach

4. List the complications of an arch aortogram.
What steps should be taken to minimize the complications you have listed ?

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I (POSTPONED) EXAMINATION
JANUARY, 2002

Date: 21st January, 2002 Time: 1.30 p.m- 4.30 p.m.

ESSAY PAPER

Answer each part in a separate book, marked A,B and C.
Each part has Four (4) questions, of which three (3) have to be answered.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1. With the aid of a well-labelled diagram describe the functioning of a conventional CT scanner. List the CT image artifacts and their causes. How can they be minimized ?

2. Describe the mechanisms by which a beam of ultrasound used for imaging looses its intensity, along the direction of transmission, as it passes through human tissue structures and fluids. (Illustrate your answer with relevant diagrams and physical laws).

3. Comment on biological effects of radiation exposure with its relevant units. How are radiation workers and members of public protected from radiation exposure? Describe briefly the protection adopted in a radiology department.

4. Describe briefly, the principle of Tc^{99m} generator and explain briefly how one experimentally determines the volume of saline required for the highest specific activity for a given type of generator ? Why is it necessary to have Tc^{99m} in high specific activity for renogram studies.

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book B)

1.

(a) Describe the technique of plain radiography of the scaphoid bone. (exposure factors are not required).

(b) Enumerate other imaging modalities available to demonstrate the scaphoid bone.

2. Draw a labelled diagram of the brain as seen in mid sagittal plane.

3. Describe the anatomy of the portal venous circulation and its systemic communications (appearances in different imaging modalities are not required).

4. Describe the anatomy of the testis of an adult as seen in ultrasonography.

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C)

1. A 42 year old female comes to the x-ray department **prepared** to undergo a double contrast barium enema examination.

(a) How would you carry out barium instillation and air insufflation ?

(b) What are the over-couch views that you would obtain ? Justify your views.

2. A 2 year old male with a diagnosis of urinary tract infection comes for a micturating cysto urethrogram (MCUG)

(a) Describe the technique of MCUG.
(b) List the complications.

3. Write short notes on the **technique of**

(a) Pancreatic ultrasound.
(b) Ultrasound evaluation of gestational age using Biparietal Diameter (BPD) and Femur Length (FL) at 20 weeks of gestation.

4. Give a brief account of
(a) Diuretic Tc^{99m} DTPA renography
(b) Use of gadolinium - DTPA in MRI of spine

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER 2002

Date: 9th December, 2002 Time: 1.30 p.m. - 4.30 p.m.

ESSAY PAPER

Answer each part in a separate book, marked A,B and C.
Each part has Four (4) questions, of which Three (3) have to be answered.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1.

(a) Radiation may have somatic or genetic effects. Explain what these terms mean.

(b) Somatic effects may be deterministic or stochastic. Discuss the conditions under which these effects are likely to occur and describe the difference between them.

(c) A whole body radiation dose of 0.01 Sv is received by a person annually for 40 years. Discuss the possible effects of this on the person concerned and compare them with those that may be suffered by a person who receives 0.05 Sv for 8 years.

2. Describe what is meant by the following terms when considering diagnostic x-rays. In particular, where relevant, discuss their impact on image quality and patient dose.

(a) The heel effect
(b) The grid Bucky factor
(c) Focal spot blooming
(d) Rotating anode
(e) The line focus principle

3.

i. Write down the Larmor's equation that relates,the magnetic field strength (in Tesla) to the radio frequency (in MHz) in MRl.

ii. What do you understand by the free induction decay signal (FID) and draw a sketch to show the decay of the signal amplitude.

iii. Explain, in brief, the reason for the decay of the amplitude drawn in your sketch above. What would you expect to happen with the degradation of the homogeneity of the magnetic field.

iv. Ignoring the effects of field inhomogeneity, briefly explain the reason for the observation of FID signals of slightly different frequency when proton density imaging is performed on regions with superficial soft tissues, especially when high field magnets are used. Write a short description on how this effect could be of disadvantage and the possibility of using the same for advantage.

4.

i. List the advantages of using intensifying screens in diagnostic radiology.

ii. Discuss briefly the main functions of the following found in a typical par speed intensifying screen.

(a) Protective Layer (Thickness 17 - 20 um)
(b) Phosphor Layer (Thickness 100 - 150 um)
(c) Tioz layer (Thickness 25um)
(d) Base (Thickness 254 um)

iii. Compare the x-ray absorption efficiency and x-ray to light conversion efficiency of rare earth screens with conventional Ca W04 screens. (Illustrate your answer with a graph).

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book B)

1. Draw a labelled diagram of the transverse section of the neck at the level of the isthmus of the thyroid gland as seen on computed tomography.

2. What are the standard plain radiographic projections for the shoulder joint? Describe radiographic technique of one projection in detail.

3. Describe the ultrasound (US) anatomy of the deep venous system of the lower limb.

4. Describe the major groups of lymph nodes in the mediastinum and pulmonary hila. You may supplement your answer with labelled diagrams.

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C)

1. Briefly describe the technique of double contrast small bowel enema (Enteroclysis) in an adult patient. (Indications not required)

2. Give a brief account of your technique of hysterosalpingography. List its indications and complications. .

3. A 40 year old male patient is referred to the Department of Radiology with the clinical diagnosis of a pituitary tumour.
   What is the approach to radiological evaluation of this problem? Give reasons for your answer.

4. Give a brief account of :

   (a) use of Gadolinium - DTP A in cranial MRI.
   (b) Glucagon

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER 2003

Date: 9th December, 2003 Time: 1.30 p.m. - 4.30 p.m.

ESSAY PAPER

Answer each part in a separate book, marked A,B and C.
Each part has Four (4) questions, of which Three (3) have to be answered.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1. Draw a labelled diagram showing the characteristic curve for a radiographic film/screen combination.
   Write brief notes on the following, using the graph where appropriate, to illustrate your answers

   (a) Optical density
   (b) Film gamma
   (c) Radiographic contrast
   (d) Latitude
   (e) Speed

2. Describe briefly the two interaction processes that occur in diagnostic radiology. Discuss how the above two processes contribute to the mammographic Image. List the measures that are used to maximise the image quality in mammography.

3.

   (a) Describe the protocol that should be followed if a woman of childbearing age attends for a diagnostic x-ray examination.

   (b) A woman who was 6 weeks pregnant underwent an x-ray examination and the foetus received an absorbed dose of 2 mGy.
   Discuss the radiation effects that could occur and the risk to the foetus.

4. Discuss the physical basis of the imaging of superficial blood vessels using diagnostic ultrasound in the continuous mode. Explain briefly the following in relation to imaging of superficial blood vessel in diagnostic ultrasound.

   (a) Quality factor of the transducer.

   (b) Parameters needed for the measurement of average volumetric blood flow in the vessel.

PART B

RADIOLOGICAL ANATOMY AND RADIOGRAPHY

(Book B)

1.
   (a) Enumerate the imaging methods available for the assessment of renal vasculature.
   (b) Describe the anatomy of the vasculature of the kidney (Appearances in different imaging techniques not required).

2.
   (a) Describe the ultrasound anatomy of hip joint of an infant with the aid of a labelled diagram.
   (b) List the other imaging modalities available to investigate the paediatric hip joint.

3.
   (a) Give the mid sagittal anatomy of the orbit with the aid of a line diagram.

   (b) Enumerate the methods available to demonstrate the orbit and its contents.

   (c) What is your choice of investigation in a patient, with a suspected optic nerve neoplasm ?

   (d) Give two reasons for your selection.

4. A patient presents with a clinically suspected acoustic neuroma.
   Discuss the radiological investigations of this patient.

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C)

1.

(a) What is your CT (Computerized Tomography) protocol for a 4cm mass lesion seen on chest radiograph ?

(b) Describe in brief the technique of percutaneous lung biopsy.

2.

(a) Briefly describe the technique of Percutaneous transhepatic Cholangiography (PTC) including preparation.

(b) List the possible complications.

3. 40 year old male has been referred for an IVU at your department.

(a) What are the information and instructions pertaining to the investigation ?

(b) Enumerate the steps you would be taken if he develops a hypersensitivity reaction before completion of the procedure.

4. Write short notes on :

(a) Dynamic Radionuclide Hepatobiliary Imaging (HIDA scan)

(b) Advantages and disadvantages of Barium sulphate (Bas04) as a contrast medium for double contrast barium enema.

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER 2004

Date: 9th December, 2004 Time: 9.30 a.m. - 12.30 p.m.

ESSAY PAPER

Answer each part in a separate book, marked A,B and C.
Each part has Four (4) questions, of which Three (3) have to be answered.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1.

(a) Draw a labelled diagram of an Image Intensifier tube used in fluoroscopy. (30 marks)

(b) Explain briefly the main functions of the following components in a typical Image Intensifier tube.

(i) Input fluorescent screen (10 marks)
(ii) Photo cathode (10 marks)
(iii) Electrostatic lenses (10 marks)
(iv) Output screen (10 marks)

(c) State briefly the difference of intensifying action between Image Intensifier tube and Intensifying screen. (30 marks)

2.

(a) Describe what is meant by "inherent filtration" and "added filtration" in radiography.
(20 marks)

Explain why filtration is important in general diagnostic x-ray imaging ?
(20 marks)

(b) State how the degree of filtration of a diagnostic x-ray beam is quantified? (15 marks)

Explain briefly how filtration affects the mean energy of an x-ray beam? (15 marks)

(c) Aluminium filters are used with Tungsten-anode x-ray tubes in general radiography while Molybdenum filters are used with Molybdenum-anode x-ray tubes in mammography.
Briefly comment on the above statement. (30 marks)

3. Explain the physical basis of trans-axial slice selection in Magnetic Resonance Imaging (MRI) for medical diagnosis? (50 marks)

Briefly discuss the biological hazards of different magnetic fields used in MRI and the basis of ensuring safety from such hazards. (50 marks)

4. Describe the formation of the pulse height spectrum in a Sodium lodide (Tl) /Photo-multiplier detector of a gamma camera? (60 marks)

Draw a sketch of such a spectrum from a patient following administration of 99m Tc containing radio pharmaceutical and label the photo-peak, 15% window and Compton continuum. (40 marks)

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book B)

1.

a) Describe the anatomy of the "secondary pulmonary lobule." (50 marks)

b) Briefly describe the CT protocol to demonstrate it. (50 marks)

2.

a) Describe the anatomy of the pituitary gland and its relations. (appearances on different imaging modalities are not required) (75 marks)

b) Discuss the appearances of it, as seen on different MRI sequences. (25 marks)

3.

a) Describe the anatomy of prostate gland and its relations. (50 marks)

b) Give a brief account on the appearances of the prostate gland in a 55 year old male as seen on Ultrasonography. (50 marks)

4.

a) Describe the technique of plain radiography of the sacroiliac joints. (80 marks)

b) Enumerate the other imaging modalities used to demonstrate the sacroiliac joints. (20 marks)

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C)

1. A surgeon brings a haemodynamically stable patient to your department 4 hours after a road traffic accident to evaluate haematuria.

   a) Enumerate the investigations available for evaluation of this patient. (40 marks)

   b) Select one of the investigations mentioned above, which requires intravenous contrast administration and briefly describe your technique in this instance. (60 marks)

2. Write short notes on patient preparation for following investigations.

   a) Ultrasonography of the abdomen and pelvis of an adult female. (25 marks)

   b) 99mTc pertechnetate Thyroid scan. (25 marks)

   c) Routine double contrast Barium enema. (25 marks)

   d) Percutaneous nephrostomy. (25 marks)

3. 60 year old male patient with a clinical diagnosis of right lower limb ischaemia, presents to your department prepared for conventional angiography.

   a) Describe in brief the technique of catheter angiography for this patient. (80 marks)

   c) List the possible complications, excluding complications due to anaesthesia and the contrast medium. (20 marks)

4. Write short notes on the technique of :

   a) T-Tube cholangiogram. (50 marks)

   b) External biliary drainage. (details of the technique of PTC are not required.) (50 marks)

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER 2005

Date: 2nd December, 2005 Time: 9.30 a.m. - 12.30 p.m.

ESSAY PAPER

Answer each part in a separate book, marked A,B and C.
Each part has Four (4) questions, of which Three (3) have to be answered.
Each question carries 100 marks.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1.

(a) Radiation can produce both deterministic and stochastic effects. Explain what these terms mean. (25 marks)

(b) Discuss the effects of ionisng radiations on the developing foetus and differentiate between deterministic and stochastic effects. Provide numerical information on the level of risk in relation to doses associated with diagnostic radiology. (50 marks)

(c) What precautions are taken to minimise the risk of irradiating the foetus of a female patient who might be pregnant?
(25 marks)

2.

(a) What is meant by the term K -shell binding energy and how does this affect the probability of the photoelectric effect?
(50 marks)

(b) Explain, with reference to a sketch of x-ray spectrum, the significance of K-shell binding energies in the choice of contrast media used for radiography and fluoroscopy.
(50 marks)

3.

(a) Draw a diagram to show the main components of a third generation (rotate-rotate) CT scanner. (50 marks)

(b) What is meant by the term slice mis-registration and how is this eliminated in spiral scanning?

(20 marks)

(c) Explain the following artefacts that may be seen in CT scanning: partial volume effect; ring artefact; beam hardening artefact. (30 marks)

4.

(a) Discuss, with reference to a labelled diagram of a single element pulse-echo diagnostic ultrasound transducer, how pulses of ultrasound with the designed value of frequency are generated?

(50 marks)

(b) Sketch the distribution of emitted frequencies of the above transducer and briefly explain how quality factor of the transducer is expressed?

(20 marks)

(c) Briefly describe the significance of quality factor in Doppler imaging?

(10 marks)

(d) What do you understand by the ringing of ultrasound pulses and why it should be reduced in pulse-echo imaging? (20 marks)

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book B)

1.

(a) Briefly write about the cardiac borders as seen in P A and later chest radiographs. Supplement your answer with line diagrams.

(60 marks)

(b) Give a short description of the course of the left coronary artery.

(40 marks)

2. Describe briefly the ultrasound anatomy of,

(a) Breast in a 20 yrs old nulliparous woman. (50 marks)
(b) Thyroid gland. (50 marks)

3.

(a) Draw a labelled line diagram of the optic pathways as seen in axial plane of MRI.

(60 marks)

(b) Describe the anatomy of the optic chiasm with its relations. (details of blood supply is not required.) (40 marks)

4. A patient is brought to your department with **clinically** suspected **mid cervical spine injury.**

(a) Discuss your technique of plain radiography of this patient. (exposure factors are not required.) (80 marks)

(b) Enumerate the other imaging modalities available to assess cervical spine injury. (20 marks)

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS
(Book C)

1.

(a) Describe the protocol of Spiral Computed Tomography of chest in suspected pulmonary thromboembolism. (details of patient preparation are not required.) (80 marks)

(b) Enumerate the other imaging modalities available to investigate a patient with pulmonary thromboembolism. (20 marks)

2. Enumerate the steps of catheter angiography in a patient with suspected right renal artery stenosis.

(100 marks)

3.

(a) Enumerate the steps in ultrasound guided percutaneous drainage of an intra abdominal abscess. (60 marks)

(b) Discuss your technique of an upper gastro intestinal contrast study on 5th post operative day, following oesophagectomy. (40 marks)

4. Discuss in short how you would modify preparation and routine technique of the Barium enema examination in four different clinical conditions. (100 marks)

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
JULY 2006

Date: 20th July, 2006 Time: 9.30 a.m. - 12.30 p.m.

ESSAY PAPER

Answer each part in a separate book, marked A,B and C.
Each part has Four (4) questions, of which Three (3) have to be answered.
Each question carries 100 marks.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1.

(a)

(i). Briefly discuss the image quality and patient dose, when a radiographic film is taken with and without a grid. (40 marks)

(ii). What are the limitations of a static, parallel grid and how can they be overcome? (20 marks)

(b) Explain the techniques used to control the scatter radiation in gamma camera with 99mTc. (40 marks)

2.

(a) Draw a labeled diagram of an image intensifier (II) tube. (20 marks)

(b) Briefly discuss the physical features of its main components. (40 marks)

(c) Describe the limitations on image quality in fluoroscopic imaging. (40 marks)

3.

(a) What is meant by "radiographic contrast". State it in quantitative terms. (30 marks)

(b) Describe the physical basis of contrast enhancement with,

(i) Iodine contrast agents in radiography. (35 marks)

ii) Aolinium contrast agent in Magnetic Resonance Imaging(MRI) (35 marks)

4.

(a) What is meant by "equivalent dose" and "effective dose" for an individual as defined by IAEA-Basic safety standard series 115 (IAEA- BSS 115). (40 marks)

(b) List the recommended annual equivalent dose limits and annual effective dose limits for public and occupational exposure categories according to IAEA- BSS 115. (40 marks)

(c) What safety measures should be followed to minimize radiation exposure for a radiation worker (Radiologist) working in the fluoroscopy machine. (20 marks)

PART B
RADIOLOGICAL ANATOMY AND RADIOGOGRAPHY
(Book B)

1.

(a) Describe the cross sectional (axial) CT anatomy of the mediastinum at the level of bronchus intermedius. (70 marks)

(b) Draw a line diagram of the right lung showing pulmonary segments as they are seen in the lateral chest radiograph. (30 marks)

2.

(a) What are the peritoneal relationships of the duodenum.. (20 marks)

(b) Briefly state the anatomical relations of the second part of the duodenum. (40 marks)

(c) Illustrate the arterial supply of the duodenum with a diagram. (40 marks)

3. Describe the transvaginal sonographic anatomy of,

(a) Uterus (50 marks)

(b) Ovary (50 marks)

in a 35 years old female

(Anatomical changes related to menstrual cycle should be included)

4.

(a) Enumerate the imaging modalities available to assess the gleno humeral joint. (40 marks)

(b) Describe two plain radiographic techniques of the gleno humeral joint. (60 marks)

PART C
RADIOLOGICAL TECHNIQUES,CONTRAST MEDIA AND DRUGS
(Book C)

1.

(a) Describe the technique of Doppler ultrasonography in a patient with suspected DVT of left leg. (50 marks)

(b) Discuss,

(i) B Mode (10 marks)
(ii) Doppler (40 marks)
Characteristics of normal superficial femoral vein.

2. A patient is suspected of having a cerebello-pontine angle SOL.

(a) Describe the spiral CT protocol you would use to assess this patient (exposure parameters not required). (40 marks)

(b) Describe the other imaging modalities to investigate this patient stating briefly the advantages and disadvantages. (exposure parameters not required). (60 marks)

3. Patient presented to your department with an ultrasound scan finding of a 3 cm focal lesion in the segment IV of the liver. Describe the technique of performing the ultrasound guided percutaneous biopsy. (100 marks)

4

(a) Discuss the management of a patient who develops bronchospasm during an IVU.

(50 marks)

(b) What are your modifications from routine IVU procedure in following conditions

(i) Ten months old child (25 marks)
(ii) Unilateral pelviureteric junction obstruction.(PUJ) (25 marks)

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER, 2006

Date: 1st December, 2006 Time: 9.30 a.m. - 12.30 p.m.

ESSAY PAPER

Answer each part in a separate book, marked A,B and C.
Each part has Four (4) questions, of which Three (3) have to be answered.
Each question carries 100 marks.

PART A
PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS
(Book A)

1.

(i)

(a) Define "subject contrast" as applied to radiography. (20 marks)

(b) Briefly explain how the subject contrast is influenced by tube voltage (kVp) selection and atomic number (Z) differences. (35 marks)

(ii)

(a) What is meant by "spatial resolution" in radiography.(20 marks)

(b) How can the spatial resolution be improved? (25 marks)

2. Briefly explain the following as applied to spin echo magnetic resonance Imaging.

(i) Effects of each pulse on the spins. (60 marks)
(ii) Data acquisition and image reconstruction method. (40 marks)

3.

(i) Explain how "windowing" and "levelling" are used to manipulate the contrast of a CT image. (40 marks)

(ii) Discuss how ultrasound is used to measure the blood flow rate and a method to. display that information on a cross sectional image in colours. (60 marks)

4.

(i) Briefly explain the three fundamental radiation protection principles set by the ICRP. (30 marks)

(ii) State current dose limits recommended by the ICRP for radiation workers and general public for whole body, lens of the eyes and the skin. (30 marks)

(iii) Briefly discuss possible effects to embryo and foetus for exposure to radiation up to dose of 100 mSv. (40 marks)

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(Book B)

1. Describe the CT (Computerized Tomography) anatomy of the pancreas with its relations. (100 marks)

2. Give an account of the anatomy of the pituitary gland and its relations in an adult as seen in MRI (Magnetic Resonance Imaging). (100 marks)

3. Describe the ultrasound anatomy of the scrotumin an-adult. (100 marks)

4. A patient is brought to your department following trauma to the right knee. Describe the plain radiographic techniques for this patient. (100 marks)

PART C
RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS - (Book C)

1. (i) Describe the technique of percutaneous nephrostomy. (80 marks)
   (ii) List the possible complications. (20 marks)

2. (i) Enumerate the steps in performing a small bowel enema. (80 marks)

   (ii) List the other radiological. investigations available to image the small bowel. (20 marks)

3. Describe your CT protocols to investigate a patient with,

   (i) a 3 cm lung mass (50 marks)
   (ii) bronchiectasis (50 marks)

4. A 60 yrs old male is suspected of having portal hypertension.

   (i) List the radiological techniques available to image the portal vein. (40 marks)

   (ii) Describe one of the techniques which requires catheter angiography. (60 marks)

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD(RADIOLOGY) PART I EXAMINATION
DECEMBER, 2007

ESSAY PAPER

Date: 4th December, 2007 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 (4) questions, of which three (3) have to be answered.

PART A

PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS (BOOK A)

1.

(a). Explain the Compton effect. (25 marks)

(b). Discuss briefly the following techniques used in radiography giving special attention to image quality, tube loading and patient dose where applicable.

(i). Beam collimation (25 marks)

(ii). Use of grids (25 marks)

(iii) Air gap technique (25 marks)

2.

(a). List five desirable properties of ^{99m}Tc as a radiopharmaceutical in nuclear imaging. (25 marks)

(b). List the factors that leads to an increase in absorbed dose to an organ which has taken up the radiopharmaceutical. (25 marks)

(c). Briefly discuss how to dispose radioactive waste in nuclear imaging. (25 marks)

(d). What radiation safety measures should be implemented to minimize the occupational exposure in a clinical nuclear imaging department. (25 marks)

3.

(a). Describe the design of a general ultrasound transducer. (25 marks)

(b). Describe the following

(i). Mechanical ultrasound scanner (25 marks)

(ii). Linear array scanner (25 marks)

(iii). Phased array scanner (25 marks)

4. Describe the following topics and their effects, on the **signal to noise ratio** and on the **resolution** in spin echo magnetic resonance imaging.

(a). Time of repetition (TR) and time to echo (TE) (50 marks)

(b). Voxel size (20 marks)

(c). Number of signal averages (15 marks)

(d). Surface coils (15 marks)

PART B
RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(BOOK B)

1. Describe the anatomy of the abdominal aorta and its branches, with the aid of a diagram. (100 marks)

2. Write an account of the sonographic appearances of the porta hepatis.

Clearly labelled line diagram/s and routine measurements of the structures should be included in the answer. (100 marks)

3. Draw a clearly labelled line diagram to show the axial CT anatomy of nasopharynx at the level of Eustachian tube. (100 marks)

4. A patient is brought to the X-ray department with a history of pelvic trauma.

a) Describe the technique of the **initial radiographic projection** you would perform on this patient (70 marks)

b) Enumerate the other imaging modalities you would perform in this patient (30 marks)

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

1. Describe your technique of performing trans-rectal ultrasound (TRUS) biopsy of the prostate gland. (100 marks)

2. A 30 yrs. old man is suspected of having a tumour at the level of 8^{th} thoracic vertebra (D8) of spinal cord

   a) Enumerate the imaging modalities. (40 marks)

   b) Describe in brief the most informative modality. (60 Marks)

3. Give a brief account on

   a) The advantages and disadvantages of renal CT over conventional IVU in suspected renal mass. (50 marks)

   b) The advantages and disadvantages of different methods of radionuc1ide cystography. (50 marks)

4. Discuss briefly

   a) Hyosine Butylbromide (Buscopan) in GIT imaging (50 marks)

   b) Gadolinium DTPA in MRI brain. (50 marks)

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART 1 EXAMINATION
DECEMBER 2009

ESSAY PAPER

Date : 8th December 2009 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 (4) questions, of which three (3) have to be answered.
Each question carries 100 marks.

PART A

PHYSICS, APPARATUS, PHOTOGRAPHY AND FILM FAULTS (BOOK A)

1.

(a) Draw a labeled diagram to show the main components of a rotating anode x-ray tube. (20 marks)

(b) Briefly explain the advantages of using a rotating anode than a fixed anode. (20 marks)

(c) Explain how scattered radiation is produced in x-ray imaging. (30 marks)

(d) What are the effects of scattered radiation on x-ray image and how can these be reduced ? (30 marks)

2.

(a)

(i) What is meant by effective half-life of a radiopharmaceutical ? (15 marks)

(ii) What percentage of original radio activity of the radiopharmaceutical remains in body after four effective half-lives ? (10 marks)

(b) Name the four types of collimators used in gamma camera and describe reasons for using each of these. (40 marks)

(c)

(i) List three radiation protection principles recommended by ICRP. (10 marks)

(ii) Briefly explain possible effects to foetus / embryo exposed to low radiation doses (<100 mSv) during 8 – 25 weeks after pregnancy. (25 marks)

3.

(a) Explain why air and bone cause problems in ultrasound imaging. (40 marks)

(b) Explain the reasons for using different ultrasound frequencies and pulse repetition frequencies in real time B-mode and pulsed Doppler ultrasound. (60 marks)

4.

(a) What are meant by spatial resolution and contrast resolution in computed tomography ? (30 marks)

(b) Explain how spatial resolution and contrast resolution are affected by the parameters of computed tomography. Limit your answer to **nine** parameters for the spatial resolution and five parameters for the contrast resolution. (70 marks)

PART B

RADIOLOGICAL ANATOMY AND RADIOGRAPHY (BOOK B)

1. Describe briefly anatomy of superficial and deep veins of the right upper limb with the aid of a labeled diagram. (100 marks)

2.
   (a) Draw a labelled line diagram of midline sagittal section of adult female pelvis as seen in T_2 weighted MRI. (60 marks)

   (b) Discuss the advantages and disadvantages of imaging modalities available to image urinary bladder. (40 marks)

3.
   (a) Enumerate imaging modalities available to investigate shoulder joint. (20 marks)

   (b) List components of rotator cuff giving the attachments. (40 marks)

   (c) Draw a line diagram of axial MRI section of shoulder joint at the level of subscapularis tendon. (40 marks)

4. A 30 year old male patient is brought to Radiology Department following road traffic accident. On clinical examination he has a normal Glasgow Coma Scale (GCS), multiple scalp injuries, facial injuries, neck pain and bleeding from ear.

   (a) What instructions would you give Radiographer regarding plain radiography of this patient ? Give reasons for your answer. (60 marks)

   (b) Choose best modality to image this patient giving your reasons. (40 marks)

PART C

RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS (BOOK C)

1.

(a) Enumerate methods available for pancreatic imaging. (40 marks)

(b) Describe your CT protocol for imaging of a suspected pancreatic mass. (60 marks)

2. An adult patient develops an acute severe reaction after IV injection of contrast media during intravenous urography (IVU).

(a) What are the signs of an acute severe contrast reaction ? (20 marks)

(b) Describe briefly the initial management of this patient. (60 marks)

(c) What are the measures you will take to prevent possible future reaction in this patient ? (20 marks)

3.

(a) Give a brief account of your technique of radiographic Micturating Cysto-Urethrography (MCUG) in a male child investigated for urinary tract infection. (70 marks)

(b) List contraindications and possible complications. (30 marks)

4.

(a) Name two scintigraphic imaging methods used in investigation of hepatobiliary system. (20 marks)

(b) Describe briefly the technique of performing a scintigraphic study on a neonate presenting with prolonged jaundice. (80 marks)

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER 2010

ESSAY PAPER

Date : 7th December 2010 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) Draw a labelled diagram of a cross sectional area of a single emulsion x-ray film and briefly explain the importance of each layer. (30 marks)

(b) Draw a typical characteristic (H &D) curve of an x-ray film and briefly explain its shape as related to contrast, base + fog, and latitude. (40 marks)

(c) How does the developer temperature affect the film contrast ? (10 marks)

(d) Compare in point form the resolution, noise, contrast and patient dose in computed radiography (CR) with those in film-screen radiography (20 marks)

2.

(a) Draw a labelled diagram of an Image Intensifier tube used in fluoroscopy and list the functions of its main components. (30 marks)

(b) Explain why Cesium Iodide (CsI) is mostly used for input phosphor in image intensifier tubes. (20 marks)

(c) How does the input diameter of the intensifier tube affect on the brightness gain ? (20 marks)

(d) Briefly describe three (03) artifacts of images produced by image intensifier tubes. (30 marks)

3.

(a) Describe the following in B mode ultrasound imaging.

(i) Shadowing artifacts (10 marks)

(ii) Enhancement artifacts (10 marks)

(iii) Side lobe artifacts (15 marks)

(iii) Grating lobe artifacts (20 marks)

(b)

(i) Explain why aliasing artifacts are more likely to occur when examining fast flow in deep blood vessels using pulsed Doppler ultrasound. (30 marks)

(ii) How can the above aliasing artifacts be minimized ? (15 marks)

4.

(a) Draw a typical pulse sequence diagram of inversion recovery magnetic resonance imaging and explain the effects of each pulse on spins. (70 marks)

(b) Explain how the inversion recovery pulse sequence is used to suppress the signal from fat and fluid. (30 marks)

PART B

RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(BOOK B)

1.

(a) Draw a line diagram of axial section of the abdomen at the level of L-l vertebra including the fascial spaces. (40 marks)

(b) Describe the ultra-sound anatomy (including Doppler) of the portal vein of an adult. (60 marks)

2.

(a) What are the boundaries of the mediastinal compartments ?(30 marks)

(b) Describe the radiological anatomy and the relations of the thoracic and abdominal oesophagus including the gastro-oesophageal junction.

(70 marks)

3.

(a) List the imaging modalities available to evaluate the cerebral circulation. (10 marks)

(b) What are the advantages and disadvantages of digital subtraction cerebral angiography ? (30 marks)

(c) Draw labeled line diagrams of frontal and lateral views of the internal carotid circulation up to third divisions of anterior and middle cerebral arteries. (60 marks)

4. A 25 year old patient with left sided chest injuries following Road Traffic Accident is brought to the Radiology Department.

(a) Mention the plain X-ray views necessary to evaluate this patient in the initial stage, briefly explaining the reasons for taking them. (Details of radiographic techniques are not required). (50 marks)

(b) Discuss the additional imaging modalities useful in further evaluation of this patient. (50 marks)

PART C

RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS (BOOK C)

1. Describe the imaging methods useful in investigating a sub-fertile couple. (100 marks)

2.
   (a) Enumerate the radiological investigations useful in evaluation of a child with intussusception. (20 marks)

   (b) Discuss the ultra-sound guided saline reduction of intussusception in an eight month old infant. (80 marks)

3. A four year old child with stridor due to a suspected vascular ring is referred to you.
   (a) Enumerate the imaging modalities useful to confirm or exclude this diagnosis. (20 marks)

   (b) Discuss the advantages and disadvantages of the above imaging modalities. (80 marks)

4. Write short notes on -

   (a) Nephrotoxicity of iodinated intra-vascular contrast media. (50 marks)

   (b) Describe briefly the technique of ultrasound guided fine needle aspiration for cytology (FNAC) of a non palpable thyroid nodule. (50 marks)

POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

MD (RADIOLOGY) PART I EXAMINATION
DECEMBER 2011

ESSAY PAPER

Date : 6th December 2011 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) Explain how the amount of scatter incident on the image receptor can be reduced in radiography. (60 marks)

(b) Explain why interventional procedures should be performed with the

(i) x-ray tube under the table whenever possible. (20 marks)

(ii) image intensifier tube as near to the patient as possible. (20 marks)

2.

(a) Briefly explain the Isomeric Transition. (10 marks)

(b) List the main components of a gamma camera head and briefly Explain their functions. (50 marks)

(c) How does the energy resolution and sensitivity of a gamma camera depend on the window setting of the pulse height analyser ? (20 marks)

(d) What is meant by low level radioactive waste ? (10 marks)

(e) Name two radioisotopes used in nuclear medicine, that generate low level radioactive waste. (10 marks)

3.

(a) Define the piezoelectric effect. (10 marks)

(b) Describe how an ultrasound transducer is designed to

(i) procedure ultrasound at a selected frequency. (15 marks)

(ii) procedure a short ultrasound pulse. (15 marks)

(iii) focus the ultrasound beam. (20 marks)

(c) Describe the behavior of an ultrasound beam at an interface between different materials. (40 marks)

4.

(a) Describe the important technical advances that led to the development of helical computed tomography (CT) scanners from axial CT scanners. (30 marks)

(b) What is meant by pitch in helical CT ? (20 marks)

(c) Describe the dosimetry parameters used in CT and their measurement methods. (40 marks)

(d) List the steps that can be taken to reduce the patient dose in CT. (10 marks)

PART B

RADIOLOGICAL ANATOMY AND RADIOGRAPHY
(BOOK B)

1. Describe the gross anatomy of the diaphragm and the radiological appearances as seen in different imaging modalities. (100 marks)

2.

(a) Draw a labeled line diagram of T-1 weighted axial Magnetic Resonance Imaging (MRI) section of the ankle , at the level of the body of the talus, including MR signal intensities of bones and tendons. (70 marks)

(b) Compare and contrast, Ultrasonography & Magnetic Resonance Imaging in radiological evaluation of the ankle. (30 marks)

3.

(a) What are the boundaries of the para-pharyngeal space ? (10 marks)

(b) List the fascial spaces of the supra hyoid neck. (20 marks)

(c) Name three (3) structures included in each fascial space. (70 marks)

4. A 25 year old patient was brought to the radiology department with a history of fall from height and suspected injury to abdominal, pelvic viscera and lumbar spine.

(a) Describe briefly the plain x-ray views needed to evaluate this patient. (40 marks)

(b) Describe briefly other imaging methods that can be used to evaluate this patient further. (60 marks)

PART C

RADIOLOGICAL TECHNIQUES, CONTRAST MEDIA AND DRUGS (BOOK C)

1. Write short notes on patient preparation & procedure of –

   (a) Neonatal brain sonography. (30 marks)

   (b) Contrast study for H-type trachea-oesophageal fistula (40 marks)

   (c) Contrast study for suspected Hirschsprung's disease. (30 marks)

2. Discuss the uses of ultrasound scanning in first trimester of pregnancy. (100 marks)

3. A 40 year old male presented to you with ultrasonically detected solitary liver lesion. Describe briefly the imaging procedures useful in further management of this patient. (80 marks)

   Enumerate the therapeutic radiological procedures available for further management of this patient. (20 marks)

4. Write brief accounts on the following

   (a) Barium Sulphate as contrast agent in large bowel examination. (40 marks)

   (b) Intra-venous hypotonic agents in upper gastro-intestinal tract contrast studies. (30 marks)

   (c) Nephrogenic systemic fibrosis (NSF) (Nephrogenic fibrosing dermopathy). (30 marks)