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MANIPAL UNIVERSITY
THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE
EXAMINATION – JANUARY 2015
SUBJECT: PAPER I – PHYSICS OF MEDICAL IMAGING

Thursday, January 01, 2015

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

Answer ALL the questions.

1. Describe the basic principle and Instrumentation for MRI. (20 marks)

2. Outline the Quality Assurance tests for Conventional Diagnostic equipment's. (20 marks)

3. **Briefly discuss or define the following:**

3A. Coherent scattering, Pair production

3B. Filters

3C. Basic principle of CT

3D. X-ray film

3E. Cones, Diaphragm

(4 marks × 5 = 20 marks)

4. **Write Short notes on:**

4A. Features of a Characteristic Curve

4B. Ultrasound

4C. Mammography

4D. Digital Radiography

(5 marks × 4 = 20 marks)



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SUBJECT: PAPER II: PHYSICS OF RADIOTHERAPY

Saturday, January 03, 2015

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

Answer ALL the questions.

1. Write in detail about the Sievert Integral method and TG-43 protocol for calculating brachytherapy dose distributions. (20 marks)
- 2A. Discuss about the XYZ method for setting up a patient for isocentric treatment.
- 2B. Write short notes on various wedge systems used in radiotherapy. (10+10 = 20 marks)
3. Define Percentage Depth Dose and explain the factors that it depends on. Also derive and equation to find the PDD at different SSD. (20 marks)
4. **Answer the following questions:**
 - 4A. Discuss about any four mechanical QA check to be done in medical linear accelerator.
 - 4B. Discuss about the effective source to surface distance method for correcting contour irregularities.
 - 4C. Write a short note on the spectral distribution of kV X-ray.
 - 4D. Write a short note on electronic portal imaging. (5 marks × 4 = 20 marks)



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EXAMINATION – JANUARY 2015

SUBJECT: PAPER III: PHYSICS IN NUCLEAR MEDICINE

Monday, January 05, 2015

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

Answer ALL the questions.

1. Write the basic principle for the cyclotron with equations. What are the different types of cyclotron and highlight the differences?
2. Compare and contrast the different detectors used in PET imaging. Which according to you is the best? Justify
3. “SPECT has an advantage over PLANAR imaging”. Justify the statement and comment.
4. What are the different quality control tests necessary for the Dose calibrator? Explain about the linearity and constancy of a dose calibrator.
5. Explain about the V-I characteristic curve for the gas detectors with suitable diagram and examples.
6. Diagrammatically (neat and detailed block diagram) explain the working of scintillation gamma camera. Very briefly write upon each component.
7. Write about the radiation protection measures to be taken in a diagnostic Nuclear Medicine department.
8. What is the main principle of RIA? How it differs from the other immune Assays?

(10 marks × 8 = 80 marks)



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EXAMINATION – JANUARY 2015

SUBJECT: PAPER IV: RADIATION SAFETY AND REGULATIONS

Wednesday, January 07, 2015

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

☞ Answer ALL the questions.

1. What are the objectives of personnel monitoring? Discuss about various personnel monitoring devices.
(20 marks)

- 2A. What are the criteria for grading the radioisotope laboratories?
- 2B. What are the pre and post therapy precautions to be taken for administering I-131?
(10+10 = 20 marks)

3. What is meant by a package? Discuss about the types and categories of packages while transporting radioactive materials.
(20 marks)

4. **Answer all the following questions.**
 - 4A. Give the typical layout for dual delay tank system and explain.
 - 4B. What is the radiation emergency preparedness in radioisotope laboratories?
 - 4C. Write a short note on hereditary effects of radiation in human beings.
 - 4D. Write a short note on solid state detectors.
(5 marks × 4 = 20 marks)

