Reg. No.									

MANIPAL UNIVERSITY

THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – MAY/JUNE 2013

SUBJECT: PAPER III: PHYSICS IN NUCLEAR MEDICINE

Saturday, June 01, 2013

Time: 10:00 – 13:00 Hrs. Max. Marks: 80

✍ **Answer ALL the questions.**

1. Explain about the different components of the Reactor. Give five examples of reactor produced radionuclides with their half-lives.

(10 marks)

2. What are collimators? What are the different types of collimators used in Nuclear Medicine imaging?

(10 marks)

3. What are the daily tests for the dose calibrator? Does it have the effect of geometry of the source on measurement? What test or corrective measurement you carry out for it?

(10 marks)

4. What does SPECT stand for in Nuclear Medicine Imaging? Briefly explain the working principle of same.

(10 marks)

5. What are the NEMA tests performed on gamma camera to ensure its functional status?

(20 marks)

6. Write short notes on the following:

6A. PMT

6B. Back projection

6C. Scalloping effect

6D. Coincidence Imaging

(5×4 = 20 marks)

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THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2013

SUBJECT: PHYSICS OF MEDICAL IMAGING

Wednesday, January 02, 2013

Time: 10:00 – 13:00 Hrs. Max. Marks: 80

✍ **Answer ALL the questions.**

1A. Describe Heel effect and discuss the factors that affect its importance in diagnostic radiology.

1B. Explain A, B, and M mode ultrasound scans.

(10+10 = 20 marks)

2. Discuss the physics behind the formation of a radiograph.

(20 marks)

3. Describe the principle and working of a Computed Tomography machine and also describe in detail the image reconstruction methods used by current clinical CT scanners.

(20 marks)

4. Write short notes on:

4A. Grids.

4B. Motion Artifact.

4C. Transducers.

4D. Importance of photoelectric effect in diagnostic radiology.

(5×4 = 20 marks)

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MANIPAL UNIVERSITY

THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2013

SUBJECT: PHYSICS OF RADIOTHERAPY

Friday, January 04, 2013

Time: 10:00 – 13:00 Hrs. Max. Marks: 80

Answer ALL the questions.

1. Discuss about the various factors that affect skin dose in radiotherapy.

2. Write short notes on the following in case of electron treatment planning:

2A. Choice of energy and field size

2B. Corrections for Air gap and beam obliquity

2C. Tissue inhomogeneities correction

2D. Use of Bolus and Absorbers

2E. Problems of Adjacent Fields

3. What are the requirements for an ideal brachytherapy source? Describe the isotopes used for Brachytherapy. Why the use of Radium has been discontinued?

(20×3 = 60 marks)

4. Answer all the questions:

4A. Write a short note on the spectral distribution of kV X-rays and effects of filtration.

4B. Discuss about any two dosimetric QA check to be done in Co-60 teletherapy units.

4C. Compare and discuss the isodose curves for photon beam, low energy electron beam and high energy electron beams using appropriate diagrams.

4D. Discuss about the method for preparing custom blocks for photons.

(5×4 = 20 marks)

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MANIPAL UNIVERSITY

THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2013

SUBJECT: PHYSICS IN NUCLEAR MEDICINE

Monday, January 07, 2013

Time: 10:00 – 13:00 Hrs. Max. Marks: 80

✍ **Answer all the questions. Each question carries 10 marks.**

1. Explain the working principle of Isotope calibrator. Write about any two QC test carried out in the justifying the importance of the test in your routine practice.

2. Describe the principle and working of scintillation gamma camera with block diagram.

3. What is Annihilation Coincidence Imaging? Give the role played by range and non-linearity in this imaging.

4. Write about the different types of separation systems in RIA.

5. What are collimators? What are the different types of collimators used in Nuclear Medicine imaging?

6. Write about the Radiation protection measures to be taken in a PET LAB and high dose radioiodine ward.

7. What are the different methods for production of radionuclides? Briefly write about the reactors and components with diagram.

8. Write about factors which are influencing the sensitivity of an assay.

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MANIPAL UNIVERSITY

THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2013

SUBJECT: RADIATION SAFETY AND REGULATIONS

Wednesday, January 09, 2013

Time: 10:00 – 13:00 Hrs. Max. Marks: 80

✍ **Answer ALL the questions.**

1. Describe the design and planning of a Cobalt Teletherapy Treatment Room.

(20 marks)

2A. Compare and contrast the features of various gas filled detectors.

2B. Write in detail about the ICRP recommended dose limits for radiation workers, pregnant women and public.

(10+10 = 20 marks)

3A. What are the different ways to control the hazard due to external radiation?

3B. What are the safety procedures to be followed while implementing the use of unsealed radioactive materials?

(10+10 = 20 marks)

4. Answer all the questions.

4A. Write short notes on:

i) Effective Dose

ii) Equivalent Dose

iii) ALI

iv) DAC

4B. Give the typical layout for a two bedded isolation ward for hospitalization of patients treated with I -131 and discuss about the shielding requirements for an isolation ward.

4C. What are the documents required to be accompanied with the packages?

4D. What are the basic guidelines for disposal of radioactive waste?

(5×4 = 20 marks)

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MANIPAL UNIVERSITY

THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION–MAY/JUNE 2013

SUBJECT: PHYSICS OF MEDICAL IMAGING

Tuesday, May 28, 2013

Time: 10:00 – 13:00 Hrs. Max. Marks: 80

Answer all questions:

1. Elucidate about the major Components of CT Scanner.

(20 marks)

2. What do you mean by DSA and explain the types of Digital Subtraction.

(20 marks)

3. Discuss about the various Interaction of radiation with matter and its usefulness in connection with radiography.

(20 marks)

4A. Enumerate the devices improving radiographic quality.

4B. Write a note on instrumentation for Mammography.

4C. Outline Conventional Tomography.

4D. Describe in detail about Radiographic Film.

(5×4 = 20 marks)

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THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION–MAY 2013

SUBJECT: PHYSICS OF RADIOTHERAPY

Thursday, May 30, 2013

Time: 10:00 – 13:00 Hrs. Max. Marks: 80

Answer all the questions.

1. Explain in detail about the construction and working of Cobalt -60 teletherapy units with its source design and various accessories used.

2. Describe the methods of converting PDD from one SSD to another.

3. Discuss about the various field shaping devices used for external beam radiotherapy.

(20×3 = 60 marks)

4. **Answer all the questions:**

4A. What are the guidelines for photon beam field matching?

4B. Discuss about the effect of blocking in electron dose rates.

4C. Elucidate the following with diagram wherever necessary:

i) Most Probable Energy

ii) Mean Energy

iii) Energy at Depth

iv) R_q, R_p, R_{max}, R_{50} and R_{90}

4D. Write a short note on the low kV therapy X-ray units.

(5×4 = 20 marks)