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# MANIPAL UNIVERSITY

## THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2016

### SUBJECT: PAPER I – PHYSICS OF MEDICAL IMAGING

Saturday, January 02, 2016

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

✍ Answer ALL the questions.

1. Discuss in detail about photostimulable phosphor technology and imaging. (20 marks)
2. Sketch an image intensifier tube, clearly label and discuss its components. (20 marks)
3. Explain in detail about Ultrasound & its applications in diagnostic radiology. (20 marks)
4. Write short notes on:
  - 4A. Characteristic Curve
  - 4B. Filtration in diagnostic X-rays
  - 4C. CT number
  - 4D. Magnets used in MRI(5 marks × 4 = 20 marks)



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MANIPAL UNIVERSITY

THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS)

DEGREE EXAMINATION – JANUARY 2016

SUBJECT: PAPER II: PHYSICS OF RADIOTHERAPY

Tuesday, January 05, 2016

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

**Answer ALL the questions.**

1. Write in detail about the various wedge systems. (20 marks)
2. Explain in detail with necessary graphs and diagram, the following characteristics of clinical electron beams:
  - 2A. Central axis depth dose curves
  - 2B. Field flatness and symmetry
  - 2C. Electron virtual source
  - 2D. X-ray contamination(20 marks)
3. Enumerate the properties of an ideal Brachytherapy source. Why the use of radium has been discontinued? Describe any four commonly used Brachytherapy sources. Include radiation parameters such as half-life, typical activity, energy, and air kerma rate constant. Comment on the clinical use of each source. (20 marks)
4. **Write short notes on the following:**
  - 4A. Tissue Maximum Ratio
  - 4B. Guidelines for field matching
  - 4C. Treatment Simulator
  - 4D. Integral dose(5 marks × 4 = 20 marks)



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**MANIPAL UNIVERSITY**  
**THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS)**  
**DEGREE EXAMINATION – JANUARY 2016**  
**SUBJECT: PAPER III: PHYSICS IN NUCLEAR MEDICINE**

Thursday, January 07, 2016

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

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*✍* Answer ALL the questions. Each question carries TEN 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 gamma camera with block diagram.
3. What is PET? Give the role played by range and non-linearity in this imaging.
4. Write on the principle of RIA and the role of tracer in the same.
5. What is the necessity of collimators in Nuclear Medicine imaging? Is it necessary that a department should have only one type of collimator? What are the different types of collimators used in Nuclear Medicine?
6. Write about the Radiation protection measures to be taken in a high dose radioiodine ward.
7. What are the different methods for production of radionuclides? Briefly write about the reactors and components with diagram.
8. Compare and contrast between PMT and photodiode.



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## MANIPAL UNIVERSITY

### THIRD SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2016

SUBJECT: PAPER – IV: RADIATION SAFETY AND REGULATIONS

Saturday, January 09, 2016

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

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✍ **Answer ALL the questions.**

1. Discuss different quality assurance tests to be performed on a brachytherapy unit.  
(20 marks)
2. Define workload, use factor and occupancy factor in shielding calculation for a radiation installation. Draw a model layout of a Telecobalt room and discuss the method of thickness calculation for primary and secondary barriers.  
(20 marks)
3. What is a package? What are the different types of package? Also write in detail about the rules and regulations involved in transport of radioactive material.  
(20 marks)
- 4A. Write a short note on ALI and DAC.
- 4B. Explain the purpose of delay tank in nuclear medicine department.
- 4C. Explain the effect of Distance in control of radiation hazard. What would be the radiation level at 25 cm from a 1 Ci source of Co-60?
- 4D. Explain the concepts of effective dose, equivalent dose and tissue weighting factor.  
(5 marks × 4 = 20 marks)

