Reg. No.										

MANIPAL ACADEMY OF HIGHER EDUCATION

MD (RADIATION ONCOLOGY) DEGREE EXAMINATION – JANUARY 2025

(REGULAR)

PAPER I

Tuesday, January 14, 2025

Time: 14:00 – 17:00 Hrs. Max. Marks: 100

Answer ALL questions.

1. Describe anatomy of Nasopharynx. Give a brief description of pathologic types in carcinoma nasopharynx. Outline the TNM staging for Ca nasopharynx.

2. What is Oxygen enhancement ratio (OER)? What is the importance of hypoxia and reoxygenation in radiotherapy? Briefly describe hypoxic cell radiosensitizers.

3. Why is Iridium 192 used in brachytherapy? Briefly describe its properties. Give the differences between Cobalt 60 and Iridium 192 for brachytherapy. What is High dose rate brachytherapy (HDR)?

4. Describe the characteristics of electron beams. Briefly demonstrate a clinical scenario where you would utilize electron beam therapy and how you would go about the process.

5. What are the 4Rs of Radiobiology? Briefly describe them. Give a short description of any two types of altered fractionation.

6. Describe the anatomy of anal canal with a neat labelled diagram. Explain the relevance of its lymphatic drainage on radiotherapy planning portals.

7. What are permanent implants? Describe seed implants in Prostate brachytherapy and their types.

8. What are beam modifying devices? Describe them briefly. Demonstrate 2D planning of breast radiotherapy using wedges with a neat labelled diagram.

9. Describe mechanisms of DNA repair and its various pathways. What is therapeutic ratio?

10. A radiotherapy technician's TLD for the last three months gave a reading of 20mSv. Is it appropriate? What are the next steps to be taken? What are the recommendations for occupational radiation exposures and how to prevent inadvertent exposure?

(10 marks × 10 = 100 marks)

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MD (RADIATION ONCOLOGY) DEGREE EXAMINATION – JANUARY 2025

(REGULAR)

PAPER II

Wednesday, January 15, 2025

Time: 14:00 – 17:00 Hrs. Max. Marks: 100

Answer ALL questions.

1. Discuss the principles and application of Intensity-Modulated Radiation Therapy (IMRT) in head and neck cancers. What are the advantages and potential challenges of IMRT compared to 3D conformal radiotherapy?

2. Describe the staging system for non-small cell lung cancer (NSCLC) as per the latest AJCC guidelines. Discuss how staging influences treatment decisions, particularly in the context of concurrent chemoradiotherapy.

3. Explain the role of Total Body Irradiation (TBI) in hematologic malignancies. Outline the planning considerations and potential acute and long-term toxicities associated with TBI.

4. Discuss adaptive radiotherapy in the management of cervical cancer. What are the clinical scenarios where adaptive radiotherapy is beneficial, and how does it improve treatment outcomes?

5. Outline the process of clinical evaluation and staging of a patient with rectal cancer. Discuss the role of neoadjuvant chemoradiotherapy in locally advanced rectal cancer.

6. Describe the setup, planning, and dosimetric challenges in Stereotactic Body Radiotherapy (SBRT) for early-stage non-small cell lung cancer (NSCLC). How does SBRT compare with surgical resection in terms of outcomes and patient selection?

7. Explain the use of biomarkers and imaging techniques in response assessment and restaging of head and neck cancers after chemoradiotherapy. Discuss the relevance of PET-CT in this context.

8. Discuss the concept and applications of proton therapy in pediatric cancers. What are the advantages of proton therapy over photon-based radiation, and what are some of the limitations in its widespread use?

9. Describe the criteria for selecting patients for re-irradiation. Outline the key considerations in planning re-irradiation in patients with recurrent or second primary cancers, focusing on dose constraints and organ tolerance.

10. Explain the radiation therapy approach in treating locally advanced prostate cancer. Discuss the role of image-guided radiation therapy (IGRT) and dose escalation in improving treatment outcomes.

(10 marks × 10 = 100 marks)

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MD (RADIATION ONCOLOGY) DEGREE EXAMINATION – JANUARY 2025

(REGULAR)

PAPER III

Thursday, January 16, 2025

Time: 14:00 – 17:00 Hrs. Max. Marks: 100

Answer ALL questions.

1. Describe the etiology, clinical features and staging of Non-small Cell Lung Cancer. What should the management approach be for a Squamous Cell carcinoma Lung staged as T3N1M0?

2. Describe the chemotherapeutic drug doxorubicin in terms of classification, mechanism of action, clinical indications, and toxicities.

3. Describe the mechanism of action and clinical applications of radioimmunotherapy.

4. What are the different types of pain and briefly discuss the various pain assessment tools?

5. Describe the indications and treatment planning of ovarian ablation.

6. Describe the hormonal therapy treatment in Carcinoma Breast in terms of indications, mechanism of action, side effect profile, and duration of treatment.

7. Management of Clear Cell Renal Cell carcinoma stage cT2N0M0?

8. Approach to cervical cancer screening and HPV vaccination?

9. Discuss the indications, treatment planning, and dose schedules of total body irradiation.

10. Classification of meningiomas and the management approach for grade III meningioma?

(10 marks × 10 = 100 marks)

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MANIPAL ACADEMY OF HIGHER EDUCATION

MD (RADIATION ONCOLOGY) DEGREE EXAMINATION – JANUARY 2025

(REGULAR)

PAPER IV

Friday, January 17, 2025

Time: 14:00 – 17:00 Hrs. Max. Marks: 100

Answer ALL the questions.

1. In the context of the proton beam in modern radiation oncology practice, explain the advantages of the proton, clinical benefit scenarios and challenges in implementation.

2. What do you understand by AI and ML? Describe two applications of AI in treatment planning and discuss the potential of AI in adaptive radiotherapy along with ethical considerations in implementing AI in clinical practice.

3. Outline the technical aspects of MRI-linac systems. Discuss the potential advantages in soft tissue visualisation and adaptive planning and describe challenges in implementing MRI-guided radiotherapy in clinical practice.

4. Define oligometastatic disease and its significance in oncology. Discuss the rationale, patient selection criteria, and recent clinical evidence for using SBRT in oligometastatic settings.

5. Describe innovations in brachytherapy delivery systems. Explain the concept and potential benefits of 3D-printed brachytherapy applicators and the role of image-guided adaptive brachytherapy in cervical cancer.

6. Explain the principle of FLASH radiotherapy and how it differs from conventional radiotherapy. Discuss the radiobiological basis for the potential advantages and the technical challenges of implementing FLASH radiotherapy.

7. Evaluate the role of circulating tumor DNA (ctDNA) in radiation oncology practice. Describe the concept, applications and challenges.

8. A 28-year-old female presents with a large, painful keloid (8 x 4 cm) on her anterior chest wall following open heart surgery 1 year ago. Previous treatments with intralesional steroids and surgical excision alone have resulted in recurrence with larger lesions. What is the pathophysiological basis for keloid formation? What are the recommended timing, dose fractionation schedule and radiation planning technique?

9. What is randomisation and its types? How is a randomised clinical trial designed?

10. Define null and alternative hypotheses for a superiority trial. What is hazard ratio and discuss Type I and Type II errors.

(10 marks × 10 = 100 marks)