2/21

1204E174

Candidate's Seat No :_____

M.Sc. Sem.-4 Examination

508

Medical Physics

April-2025

Time : 2-30 Hours] **[Max. Marks : 70**

Q.1 Explain the difference between absorbed dose, dose equivalent, and exposure in radiotherapy. Provide the units associated with each quantity and describe how they are measured in clinical practice. [14]

OR

Q.1 Explain in detail the mechanism of isotope production using nuclear reactor and cyclotron. Name at least two isotopes produced by them and used in medicine. [14]

Q.2 Discuss the methods used to measure D_w (dose to water) for external beams delivered by a cobalt-60 teletherapy machine. Include a detailed explanation of the process, equipment (such as ionization chambers), and measurement protocols. How do factors like beam energy, field size, and patient positioning influence the accuracy of Dw measurement, and what steps are taken to minimize errors? [14]

OR

Q.2 Discuss the different types of brachytherapy sources (e.g., Ir-192, Cs-137, I-125) and the methods used to standardize their activity and dose distribution. Explain the significance of using the reference air kerma rate (RAKR) and the concept of dose rate in ensuring consistent treatment outcomes. [14]

Q.3 Explain in detail working principle and application of Extrapolation chamber. [14]

OR

Q.3 What is the classification of neutrons. How the neutron deposit their energy into the medium. How the neutrons being detected using various detectors? [14]

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E174-2

Q.4 Explain working principle of Fricke dosimeter. What are the different factors influences dosimetry. [14]

OR

Q.4 What are the requirements of an ideal chemical dosimeter? What are the applications of chemical dosimeters in Radiotherapy and industrial irradiators? [14]

Q.5 Attempt any seven out of twelve from the following (Each question is of two marks): [14]

(i) What is the unit of absorbed dose in radiotherapy, and what does it represent?

(ii) What is the SI unit of activity, and what does it measure in the context of radiotherapy?

(iii) What is the purpose of using a radiation weighting factor in calculating dose equivalent?

(iv) What is the significance of the tissue-phantom ratio (TPR) in dosimetry for X-ray and gamma-ray beams?

(v) How does the depth dose distribution affect the measurement of Dw in external beam radiotherapy using cobalt-60?

(vi) Explain the role of the TG-43 protocol in the dosimetric standardization of brachytherapy sources.

(vii) What are the various neutron classifications?

(viii) What is LET?

(ix) What are the various sources of neutron?

(x) What is a free radical?

(xi) Name 2 solid state detectors?

(xii) What is G-value