SEMESTER - III

Paper - V : Radiation Physics

Max. Marks: 55
Time: 3 Hrs.

Note: Nine questions will be set and students will attempt 5 questions. Question No. 1 will be compulsory consisting of 4 parts based on the conceptual aspects of the whole syllabus. The answers should not be in yes/no. In addition to Question No. 1 there will be four Units in the question-paper each containing two questions belonging to four Units in the syllabus. Students will select one question from each unit.

UNIT - I

Radiation and need for its measurement, Physical features of radiation, Conventional sources of radiation,
Exposure to natural radiation: external to the body, Radiation from cosmic rays and solar radiation, Internal exposure to the body, Radioactivity arising from technological development: Possible health hazards from nuclear and laser radiations
Maximum permissible level of radiation. Radiation quantities and units of energy flux, energy fluence, cross-section, linear energy transfer, Specific energy and absorbed dose, Relative effectiveness of radiation, dose equivalent.

UNIT - II

Biological effects of radiation: Dose - response characteristics, Direct and indirect action, acute effects, Delayed effects, Cumulative effect, Accidental exposure, Radiation induced chemical changes in tissues, Radiation protection procedures (diagnostics and therapy).
Basic radiation safety criteria, Protection from direct radiation, Energy deposition, Effect of distance and shielding, Protection from contamination, Preparation of a safe radiation area,
Radioactive waste disposal and management: Type of radioactive waste, Airborne waste, Solid and liquid waste, Assessment of Hazard.

UNIT - III

Basic Principles of patient monitoring and diagnostic using radiation and isotopes, Principles of radiation therapy. Physics of diagnostic X-rays, Production and Absorption of X-rays, X-ray imaging, X-ray fluroscopy.
Computerised Axial Tomography (CAT), Ultrasound Scanning, Ultrasound picture of the body, Ultrasound to measure motion, Physiological effects of ultrasound in therapy, Electrocardiograhy (ECG), Pacemakers, Gamma Camera, Position Emission Tomography (PET), Magnet Resonance Imaging (MRI).

UNIT - IV

Basic features of radiation dose measurements, Brief introduction and principles of ionization chamber, Generation of charge, Ionization and exposure, Electron equilibrium.
Thermoluminescence: Principles and methods, Basic concepts, Thermoluminescence emission process, characteristic of TL, Glow Curves and Spectra of TL,
Solid state Nuclear Track Detector (SSNTD), Track processing methods, Chemical track etching, track dyeing, Track decoration, Etch track evolution, Plastic detectors.
ESR Dosimeter: basic principle, and application

References

1. Introduction to Health Physics - Herman Cember, Pergamon Press.
2. Introduction to Radiation Protection - Martiz and Harbinsor, John Willey and Sons.
3. Medical Physics - J.R. Cameron, and J.G. Skotronick, John Willy Sons
4. Introduction to Radiobiology and Radiation Dosimetery - F.H. Aurix, John Wiley.
5. Techniques of Radiation Dosimetery - Editors K. Mahesh and DR Vij Wiley Eastern Limited.
6. Nuclear Energy - Raymond L. Murray Pergamon Press, N.Y.