QP Code: 105391 **Reg. No.....**

Post M.Sc Diploma in Radiological Physics Supplementary Examinations March 2019

Radiation Dosimetry and Standardisation

Time: 3 hours **Max. Marks: 100**

- **Answer all questions**
- **Use of Calculators/physical and mathematical tables permitted.**

Essays **(2x14=28)**

1. Explain Burlin and Spencer-Attix cavity theory. Discuss its merits and demerits over Bragg-Gray cavity theory.
   Alpha source of 100 Bq activity with 6 MeV energy is kept inside the gas filled detector. If all particles completely absorb their energy inside the detector, calculate the average current from the detector (take 30 eV is the average energy required for one electron ion pair and unit electric charge is 1.6×10^{-19} C). (9+5)
2. Describe in detail about the measurement of absorbed dose to water for high energy electron beams using TRS 398 protocol.
   Calculate the dose rate in Gy/min for the average electrometer reading of 26 nC for a set machine time of 3 minutes in a telecobalt unit using the following parameters: $T_1 = 22^0$ C, $T_2 = 22.2^0$ C, $P_1 = 977$ mbar, $P_2 = 978$ mbar, $\tau = 0.02$ min, $N_{D,W}$ of the dosimeter = 4.83×10^7 Gy/C at 20^0 C and 1013.2 mbar. (9+5)

Short Essays **(4x8=32)**

3. Describe in detail about the classification of neutron sources and dosimetry procedures.
4. Explain how the Ir^{192} source is calibrated using well type ionization chamber.
5. Derive the relationship between kerma, absorbed dose and exposure under charged particle equilibrium condition.
6. Describe Fricke dosimeter and its applications in radiotherapy

Short Notes **(10x4=40)**

7. Primary and secondary standard dosimeters
8. Beer-Lambert's Law
9. Free radicals and Radiation chemical yield
10. Neutron threshold detectors
11. Reactor produced isotopes
12. Bubble detector
13. Charged particle equilibrium
14. Two voltage method for continuous and pulsed beam
15. Properties of I-125 source
16. Neutron yield

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