

[Time: 2 ½ Hours]

[ Marks:60]

Please check whether you have got the right question paper.

N.B:

1. **All questions carry equal marks.**
2. **All questions are compulsory.**
3. **Draw a necessary diagram whenever necessary.**

1. a. Discuss the factors responsible for clinical radio resistance. 06

1. b. Standard protocol of 2Gy-30 fractions has to be rescheduled to be completed in 24 fractions delivered in the same overall treatment time, calculate the dose per fraction to deliver the same tumour BED, given that the  $\alpha/\beta$  value for the tumour is 10Gy. 06

OR

1. a. Name the different tumour cell kinetic parameters *and* show the relationship between them. 06

1. b. LDR brachytherapy protocol of 1 Gy/h for 48h needs to be replaced 3 HDR fractions. Given that the  $\alpha/\beta = 10\text{Gy}$  and  $\mu = 1\text{h}^{-1}$ , calculate the dose per HDR fraction to deliver the same BED. 06

2. a. Name and explain the various factors influencing the percentage depth dose. 06

2. b. Explain the formation of a radiological image on a x-ray film with the help of a neat diagram. 06

OR

2. a. Explain the important differences between external beam radiotherapy and brachytherapy. 06

2. b. Explain the term " $\gamma$ " of the film with the help of a diagram. What is the relationship between brightness contrast and exposure contrast and " $\gamma$ " of the film? 06

3. **Give reasons:** 12

- i. Hypaque is injected to visualise the blood vessels during radiography
- ii. Effective dose limits to public is 1 mSv/y and for radiation workers it is 20mSv/y.
- iii. Radiation therapy is done by using multiple fields and sometimes by rotation therapy.
- iv. Accelerators with high energy photon beams are used to treat deep seated tumours.
- v. Mammography units use Molybdenum or Rhodium targets.
- vi. Fractionated radiotherapy requires a total dose of 60-70 Gy to achieve good cure rate.

TURN OVER

## 3. Give Reasons:

12

- i. Grids improve the quality of radiograph.
- ii. Nitroimidazole derivatives sometimes used to improve radiotherapy.
- iii. Melanomas and sarcomas are radioresistant.
- iv. Some tumours respond better when the treatment duration is reduced.
- v. Large tumours are difficult to cure.
- vi. Fluoroscopic examinations are done at tube current less than 5 mA.

## 4. a. Describe in detail the interaction of photons with matter?

06

b. Write a note on Radioisotope Generators. Give details of the  $^{99}\text{Mo}$ - $^{99\text{m}}\text{Tc}$  Isotope Generator system.

06

OR

## a. Write a note on Imaging of Body organs. Explain the procedure of Thyroid imaging.

06

## b. Discuss in detail the technique of Positron Emission Tomography.

06

5. Write short notes on **any three** of the following topics

12

- a) Rare earth screens
- b) Film processing
- c) Tissue equivalent phantom
- d) Permanent implants
- e) Tube shift method (foreign body localization)
- f) Mayneords F
- g) Back Scatter factor (BSF)

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