

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[AHS 0222]

**FEBRUARY 2022
(OCTOBER 2021 EXAM SESSION)**

Sub. Code: 4017

M.Sc. MEDICAL PHYSICS

FIRST YEAR

(Candidates admitted from 2010-2011 onwards – Paper VII)

(Candidates admitted from 2020-2021 onwards – Paper VIII)

PAPER VII & VIII – PHYSICS OF RADIATION THERAPY

Q.P. Code : 284017

Time: Three hours

Answer ALL Questions

Maximum: 100 Marks

I. Elaborate notes on:

(2 x 20 = 40)

1. Describe the principle, construction and working of a Van De Graff generator and its role in megavoltage therapy. Also, highlight its advantages and disadvantages.
2. Explain in detail the role of a shutter system in a Telecobalt unit and describe the different types of shutter systems with neat diagrams and list their uses and limitations.

II. Write Short Notes on:

(10x6 = 60)

1. Selection of energy for patient treatment with electron beam therapy.
2. *In vivo* dosimetry and its applications in radiotherapy.
3. What is a dose volume histogram? How is used in the evaluation of treatment plans?
4. Classification of brachytherapy based on dose-rate.
5. Commissioning of a new treatment planning system in radiotherapy.
6. Explain Sievert integral method.
7. Principle and working of a betatron for radiotherapy.
8. Write about the concept of surface dose in photon beam therapy, its impact with beam energy and its clinical implications.
9. List the various radioisotopes used in brachytherapy and tabulate their physical characteristics such as energy, half-life, specific activity, and exposure rate constant.
10. How does a standing waveguide accelerate electrons in a linear accelerator? Emphasize its merits over the travelling waveguide.

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[AHS 1022]

OCTOBER 2022

Sub. Code: 4017

M.Sc. MEDICAL PHYSICS

FIRST YEAR

(Candidates admitted from 2010-2011 onwards – Paper VII)

(Candidates admitted from 2020-2021 onwards – Paper VIII)

PAPER - VII & VIII – PHYSICS OF RADIATION THERAPY

Q.P. Code : 284017

Time: Three hours

Answer ALL Questions

Maximum: 100 Marks

I. Elaborate notes on:

(2 x 20 = 40)

1. Explain the role of wave guide. Discuss about standing and traveling wave guide.
2. Describe in detail about Van De Graff generator, Cyclotron and Betatron.

II. Write Short Notes on:

(10x6 = 60)

1. Differentiate bolus and compensator, discuss benefit to patient.
2. Define relationship between TAR and PDD.
3. Explain the types of wedge filters and different wedge angles.
4. Discuss commissioning of Medical linear accelerator.
5. What do you understand about ICRU 50 and 62?
6. Write in detail about output factor of a cobalt beam.
7. What is a phantom? Discuss types of phantom.
8. Explain Portal and invivo dosimetry, Electronic portal Device.
9. Application of DICOM image import/export in radiotherapy.
10. Medical application of Radioisotope and RAKR / AKR definition.

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[AHS 1023]

OCTOBER 2023

Sub. Code: 4017

**M.Sc. MEDICAL PHYSICS
FIRST YEAR (From 2020-2021 onwards)
PAPER VIII – PHYSICS OF RADIATION THERAPY**

Q.P. Code: 284017

Time: Three hours

Answer ALL Questions

Maximum: 100 Marks

I. Elaborate notes on:

(2 x 20 = 40)

1. Discuss in detail about Klystron, Magnetron and Wave guide.
2. Describe construction and working of RFA and discuss measurement of isodose curves.

II. Write Short Notes on:

(10x6 = 60)

1. What is Grenz ray therapy, ortho voltage therapy?
2. Explain spectral distribution of KV X-rays.
3. Beam collimation, Penumbra, Trimmers.
4. Different shutter systems in teletherapy units.
5. Output calibration of Gamma rays (^{60}Co) unit.
6. How to calibrate X-rays and electrons using TRS 398 protocol?
7. What is synchrotron and cyclotron?
8. Define PDD, TAR and TPR.
9. Discuss different types of filters, How it is used to modify Beams?
10. Explain CTV, PTV and GTV which one is more significant?

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[AHS 1024]

OCTOBER 2024

Sub. Code: 4017

**M.Sc. MEDICAL PHYSICS
FIRST YEAR (From 2020-2021 onwards)
PAPER VIII – PHYSICS OF RADIATION THERAPY**

Q.P. Code: 284017

Time: Three hours

Answer ALL Questions

Maximum: 100 Marks

I. Elaborate notes on:

(2 x 20 = 40)

1. Describe construction and working of Magnetron and discuss merits and demerits.
2. Explain Treatment planning in teletherapy SSD and SAD techniques with diagram and discuss 2D, 3D, planning.

II. Write Short Notes on:

(10x6 = 60)

1. Discuss KV Therapy X-ray units and application.
2. Write in detail about beam direction devices, front, back, pointers.
3. Beam collimation, Penumbra, Trimmers.
4. Explain TRS- 398, TG- 51 protocol for photon beam calibration.
5. Differentiate X-rays and Gama rays in radiotherapy.
6. Discuss in detail about resonant transformer.
7. What is a klystron? How it is useful in LINAC?
8. Mention different types of phantoms and tissue equivalent materials.
9. What is Bolus and compensator, discuss its application.
10. Discuss various radioisotopes used in brachytherapy and explain their energy, characteristic, specific activity, and exposure rate.

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[AHS 1025]

OCTOBER 2025

Sub. Code: 4017

**M.Sc. MEDICAL PHYSICS
FIRST YEAR (From 2020-2021 onwards)
PAPER VIII – PHYSICS OF RADIATION THERAPY**

Q.P. Code: 284017

Time: Three hours

Answer ALL Questions

Maximum: 100 Marks

I. Elaborate notes on:

(2 x 20 = 40)

1. Describe construction and working of telecobalt unit and describe the different type of shutter systems.
2. Explain the Quality assurance protocols for Linear Accelerator by using TG-142.

II. Write Short Notes on:

(10x6 = 60)

1. Explain the details of accelerator facilities in India.
2. Explain principle and working of klystron and Magnetron.
3. Describe Dose Volume Histogram.
4. What is the beam modifying device commonly used in radiotherapy treatment?
5. Describe GTV, ITV and Hotspot by using ICRP 62.
6. What is TAR? What are the factors affecting TAR?
7. What are the radioisotopes commonly used in brachytherapy?
8. Explain DICOM and PACS.
9. Explain principle and working of Electronic Portal Imaging Device.
10. Describe Neutron Capture Therapy.
