**GOVERNMENT OF KERALA**
**DIRECTORATE OF MEDICAL EDUCATION**
**DIPLOMA IN RADIODIAGNOSIS & RADIOTHERAPY TECHNOLOGY**
**REGULAR & SUPPLEMENTARY EXAMINATIONS APRIL 2024**

**DRRT-F-I-APR-2024**

Time 3hrs **Part 1 paper 1** Max 100 Marks

## GENERAL AND RADIATION PHYSICS

(Answer Section A & B separately and draw diagrams wherever necessary)

## SECTION-A

**I. Explain the following** **(5x3=15)**

a. Inverse square law
b. Faradays law
c. SI units
d. Electromagnetic spectrum
e. Isotopes, Isobars and isomers

**II. Answer the following** **(3x5=15)**

a. What is the difference between Ferromagnetic, paramagnetic and diamagnetic materials?
b. Explain various nuclear reactions
c. Explain various types of logic gates

**III. Answer the following** **(1x20=20)**

Explain the working of a moving coil galvanometer. How it can be converted in to an ammeter and a voltmeter

## SECTION B

**IV. Explain the following** **(5x3=15)**

a. Line focus principle
b. Pair production
c. Mass attenuation coefficient
d. Exposure
e. Parallel plate chamber

**V. Answer the following** **(3x5=15)**

a. Explain how TLD is used for dose measurement
b. Explain in detail about photoelectric effect
c. Explain the difference between Characteristic and Bremsstrahlung radiation

**VI. Answer the following** **(1x20=20)**

With the help of a neat diagram explain the working of a self rectified X-ray circuit

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**DRRT-F-II—APR-2024**

Time 3hrs **Part 1 paper - II** Max 100 Marks

## ANATOMY

(Answer Section A & B separately and draw diagrams wherever necessary)

## SECTION-A

**I.** Describe respiratory system under the following headings **(2+3+4+1=10)**

a) Parts
b) Pleura
c) Lungs
d) Radiological Investigation

**II. Answer briefly on:** **(5x5=25)**

a. Liver
b. Joint
c. Epithelium
d. Ovary
e. Salivary glands

**III. Write short notes on** **(5x3=15)**

a. Sternum
b. Skin
c. Urethra
d. White matter
e. Small intestine

## SECTION B

I. Enumerate the parts of female reproductive system. Describe briefly the anatomy of uterus and fallopian tube. Mention one radiological investigation of female reproductive tract. **(2+4+3+1=10)**

**II. Answer briefly on** **(5x5=25)**

a. Diaphragm
b. Ureter
c. Spinal cord
d. Muscular tissue
e. Pituitary gland

**III. Write Short notes on:** **(5x3=15)**

a. Aorta
b. Peritoneum
c. Lymphnode
d. Esophagus
e. Appendix

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**DRRT-F-III-APR-2024**

Time 3hrs **Part 1 paper III** Max 100 Marks

## PHYSIOLOGY AND PATHOLOGY

(Answer Section A & B separately and draw diagrams wherever necessary)

### SECTION A

I. Define Anemia. What are the causes of Anemia? Add a note on classification of Anemia. **(10)**

II. **Write short notes on** **(5x5=25)**

a. ABO Blood group
b. Hypoxia
c. ECG
d. Role of calcium in human body
e. Functions of Insulin

III. **Define the following** **(5x2=10)**

a. Tidal Volume
b. Action Potential
c. Heart rate
d. Tubuloglomerular feed-back
e. Ovulation

IV. **Name the following** **(5x1=5)**

a. Blood cell which helps in coagulation of blood
b. Junction between two neurons
c. Functional unit of kidney
d. Enzyme produced from stomach
e. Pacemaker of heart

P.T.O

## SECTION B

**I.** Define Neoplasia. Explain the differences between benign and malignant tumours. Describe the routes of metastatis **(2+4+4=10)**

**II. Write short notes on : (5x5=25)**

a. Megaloblastic Anemia

b. Paraneoplastic Syndromes

c. Pneumonia

d. Pathogenesis of Thrombus formation

e. Gangrene

**III. Define the following: (5x2=10)**

a. Repair b. Hypertrophy

c. Inflammation d. Exudate

e. Congestion

**IV. Name the following (5x1=5)**

a. Two benign tumours

b. Two Premalignant lesions

c. Two DNA viruses

d. Two causes of eosinophilia

e. Two causes of cell injury

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**DRRT-S-I-APR-2024**

Time 3hrs **Part II paper I** Max 100 Marks

## PHYSICS OF MEDICAL IMGAGING AND RADIOTHERAPY

(Answer Section A & B separately and draw diagrams wherever necessary)

## SECTION A

**I. Explain the following** **(5x3=15)**

a. Heal effect
b. Hounsfield unit, Window and window width in CT
c. Fluoroscopy
d. Anode of Mammographic machine
e. Rotating anode and its advantage

**II. Discuss the following** **(3x5=15)**

a. PET and SPECT
b. The spectral distribution of X-rays emitted by an X-ray tube
c. Principles of MRI

**III.** Answer the following **(2x10=20)**

a. Discuss in detail the image formation in Ultra sound scan.
b. Explain Doppler effect in US scan

## SECTION B

**IV. Explain the following** **(5x3=15)**

a. Wedge angle and Hinge angle
b. TPR, TMR and PDD
c. Bragg peak
d. HDR and LDR
e. Electron gun

**V. Answer the following** **(3x5=15)**

a. What are isodose curves. Discuss the isodose curves of photon beam and Electron beam
b. What is Mayneord factor. The PDD of 15x15 field size, 10cm depth and 80cm SSD is 58.6, for a co-60 beam. Using maymeord formula find the PDD for the same field size and depth for a 100cm SSD
c. Explain different types of wedges

**VI. Essay** **(2x10=20)**

a. Explain the working and functioning of a LINAC
b. Discuss the use of Wedge filters and compensating filters in the megavoltage photon beam radiotherapy, indicating the physical principles involved in their design and application

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Time 3hrs **Part II paper II** Max 100 Marks

## RADIOGRAPHY TECHNIQUES

(Answer Section A & B separately and draw diagrams wherever necessary)

## SECTION A

**I.** Discuss the different standard radiographic views of Scaphoid – Explain the indications, technique, positioning and centering for each in detail.

**(5+10=15)**

**II. Write short notes on** **(7x5=35)**

a. Towne's View
b. X-ray KUB
c. X-ray films
d. Tomography
e. Air gap technique
f. Frog leg position
g. Imaging of Temporomandibular joint

## SECTION B

**I.** Describe the indications, patient preparation, procedure and filming sequences for micturating cystourethrogram. **(15)**

**II. Write short notes on :** **(5x5=25)**

a. Benefits of Fluoroscopy in Contrast procedure
b. Advantages of non ionic intravenous contrast.
c. Parotid sialogram- contrast agent used, technique, common views.
d. Indication and contra Indication for Barium Swallow.
e. HSG

**III. Explain the following** **(5x2=10)**

**a.** PACS
**b.** Types of urethrogram
**c.** Effervescent agents in radiography
**d.** Safety considerations in ward radiography.
**e.** Contrast media used to study Gastrointestinal Tract.

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Time 3hrs **Part II paper III** Max 100 Marks

## BASICS OF RADIOTHERAPY

(Answer Section A & B separately and draw diagrams wherever necessary)

## SECTION A

**I**. Describe the staging of Carcinoma of the cervix. Explain the radiation treatment of cervical cancer & its toxicity **(25)**

**II. Write Short notes on** **(5x5=25)**

**a.** Point B

**b.** Cell survival curve

**c.** Bolus

**d.** PAP smear

**e.** Concurrent chemoradiation

## SECTION B

**I.** Describe the staging of rectal Cancer. What is the treatment for locally advanced rectal cancer. Explain Radiation treatment in rectal cancer and radiation toxicity. **(25)**

**II. Write Short notes on** **(5x5=25)**

a. Cancer registry

b. TLD

c. Hypofractionation and its uses

d. Advantages of Linear accelerator

e. Tumour markers

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**DRRT-T-I-APR-2024**

Time 3hrs **Part III paper I** Max 100 Marks

## RADIATION SAFETY IN RADIODIAGNOSIS AND RADIOTHERAPY

(Answer Section A & B separately and draw diagrams wherever necessary)

### SECTION A

**I. Define** **(5x3=15)**

a. Inherent filter
b. Shock proofing of X-ray tube
c. Stochastic effect
d. Diode Detector
e. External Quenching of GM counter

**II. Describe** **(3x5=15)**

a. How is the mA linearity checked in an X-ray unit. What is the tolerance level permitted by AERB?
b. AERB safety requirements for the installation of mammography unit.
c. How the radiation safety is achieved in a IOPA Dental unit?

**III.** **a**. What are the AERB requirements in Starting a new Diagnostic CT unit in a hospital? What are the responsibilities of a radiographer in achieving safety in a CT unit? **(10)**

**b.** What is the need of Fine focus and Broad focus filament? What are filament size values of fine and Broad focus filaments. How is the quality of fine and broad foci are verified. **(10)**

### SECTION B

**I. Define** **(5x3=15)**

a. Gamma ray constant & K factor
b. Kerma & Absorbed dose
c. OER
d. Specific activity & its unit
e. Use factor in Teletherapy unit

**II. Describe** **(3x5=15)**

a. Describe decay of Cs-137 source with the help of diagram. What are the Beta energy values?
b. Dose rate at a point 80cm away from a telecobalt unit is 250 rads/mt. what is the dose rate at one meter from the source?
c. Activity of a telecobalt source is 12,000 Ci. If K factor is one R-meter square per curie hr, What is the value of RHM and RMM.

**III.** **a**. Draw the cross sectional view of a linear Accelerator room including control console **(10)**

**b.** What are the important parts of the linear accelerator? Briefly describe the functions of the important parts. **(10)**

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**DRRT-T-II-APR-2024**

Time 3hrs **Part III paper II** Max 100 Marks

## ADVANCED MEDICAL IMAGING TECHNOLOGIES

(Answer Section A & B separately and draw diagrams wherever necessary)

## SECTION A

I. Discuss CT physics and various generations of CT. Explain HRCT technique **(15)**

**II. Write short notes on (6x5=30)**

a. MR relaxation time
b. Radiation safety steps in CT room
c. Thermoluminescent Dosimeter
d. MRI brain – Common sequences
e. Sources of Radiation
f. Digital radiography

**III. Expand the following (5x1=5)**

a. STIR
b. VRT
c. PET
d. DLP
e. FOV

## SECTION B

I. Describe the techniques of Mammography with Patient Preparation, Positioning, views, filming and Radiation Dose. **(15)**

II. **Write short notes on (7x5=35)**

a. Radiation safety in DSA room
b. CT Urogram
c. MR contrast agents
d. CR image processing methods
e. Ultrasound probes
f. Microwave ablation
g. Types of MRI coils

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Time 3hrs **Part III paper III** Max 100 Marks

## ADVANCED RADIOTHERAPY

(Answer Section A & B separately and draw diagrams wherever necessary)

### SECTION A

**I.** Describe in detail the risk factors, clinical presentation, investigations, staging and treatment of high grade brain tumours **(5+5+5+5+5+=25)**

**II.** **Write Short Note** **( 5x5=25)**

a. Role of radiotherapy in benign conditions
b. Acute toxicities of radiotherapy in lung cancer
c. Gastro-intestinal toxicity associated with radiotherapy
d. IMRT and its advantage over conventional radiotherapy
e. Proton therapy and its clinical application

### SECTION B

**I.** Describe in detail the risk factors, clinical presentation, investigations, staging and treatment of carcinoma breast. **(5+5+5+5+5=25)**

**II.** **Write Short Notes** **(5x5=25)**

**a.** Describe a mammalian cell cycle
**b.** LQ model of cell survival
**c.** Compare between HDR vs LDR brachytherapy
**d.** Treatment overview of carcinoma endometrium
**e.** Anatomy and relations of nasopharynx

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