

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

25-0002-AC

TEST BOOKLET

Time Allowed: 3:00 hrs

MAIN PAPER

Maximum Marks: 120

RADIOGRAPHER/CT SCAN RADIOGRAPHER TECHNICIAN

INSTRUCTIONS TO CANDIDATES

Read the instructions carefully before answering the questions: -

1. This Test Booklet consists of 12 (twelve) pages and has 72 (seventy two) items (questions).
2. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS BOOKLET **DOES NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
3. Please note that it is the candidate's responsibility to fill in the Roll Number and other required details carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet and the Separate Answer Booklet. Any omission/discrepancy will render the OMR Answer Sheet and the Separate Answer Booklet liable for rejection.
4. Do not write anything else on the OMR Answer Sheet except the required information. Before you proceed to mark in the OMR Answer Sheet, please ensure that you have filled in the required particulars as per given instructions.
5. Use **only Black Ball Point Pen** to fill the OMR Answer Sheet.
6. This Test Booklet is divided into 4 (four) parts – **Part – I, Part - II and Part – III**
7. All **THREE** parts are **Compulsory**.
8. **Part-I consists of Multiple Choice-based Questions.** The answers to these questions have to be marked in the OMR Answer Sheet provided to you.
9. **Part - II and Part – III consists of Conventional Questions.** The answers to these questions have to be written in the **Separate Answer Booklet** provided to you.
10. In Part-I, each item (question) comprises of 04 (four) responses (answers). You are required to select the response which you want to mark on the OMR Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each item.
11. After you have completed filling in all your responses on the OMR Answer Sheet and the Answer Booklet(s) and the examination has concluded, you should hand over to the Invigilator **only the OMR Answer Sheet and the Answer Booklet(s)**. You are permitted to take the Test Booklet with you.
12. **Penalty for wrong answers in Multiple Choice-based Questions:**
THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE.
 - (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third** of the marks assigned to the question will be deducted as penalty.
 - (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to the question.
 - (iii) If a question is left blank. i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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PART – I

MULTIPLE CHOICE BASED QUESTIONS

Instructions for Questions 1 to 60:

- Choose the correct answer for the following questions
- Each question carries 1 marks (60 x 1 = 60 marks)

1. The effective dose in CT is measured in which unit?
 - a) Gray (Gy)
 - b) Becquerel (Bq)
 - c) Sievert (Sv)
 - d) Curie (Ci)
2. The artifact caused by metal objects in a CT scan is commonly known as:
 - a) Beam hardening
 - b) Partial volume artifact
 - c) Ring artifact
 - d) Streak artifact
3. What does the gantry in a CT scanner primarily house?
 - a) The patient bed
 - b) The image reconstruction system
 - c) The X-ray tube and detectors
 - d) The power supply unit
4. Which reconstruction technique is typically used to reduce noise in CT images?
 - a) Filtered back projection (FBP)
 - b) Iterative reconstruction
 - c) Fourier transform
 - d) MPR (Multiplanar reconstruction)
5. What is the main advantage of spiral CT over conventional CT?
 - a) Better contrast resolution
 - b) Continuous data acquisition and faster scan times
 - c) Reduced radiation exposure
 - d) Higher spatial resolution

6. Which factor influences the dose length product (DLP) in a CT scan?
 - a) mAs and kVp
 - b) Field of view and slice thickness
 - c) Table speed and pitch
 - d) All of the above
7. What is the major risk associated with repeated CT scans?
 - a) Increased cancer risk due to ionizing radiation
 - b) Renal failure
 - c) Increased likelihood of image artifacts
 - d) Inaccurate diagnosis
8. In cardiac CT imaging, what is the typical range for the heart rate required for optimal imaging?
 - a) 50-60 bpm
 - b) 60-70 bpm
 - c) 70-80 bpm
 - d) 80-90 bpm
9. In CT perfusion imaging, what is measured to assess tissue viability?
 - a) Blood flow and blood volume
 - b) Attenuation coefficient
 - c) Spatial resolution
 - d) X-ray photon energy
10. Which of the following is a contraindication for the use of iodinated contrast agents in CT?
 - a) Pregnancy
 - b) Diabetes
 - c) Renal impairment
 - d) Hypertension
11. What does "isotropic resolution" refer to in CT imaging?
 - a) Equal resolution in all planes (x, y, and z axes)
 - b) Higher resolution in one plane
 - c) The ability to image moving objects
 - d) Improved temporal resolution

12. Which of the following is the best way to reduce motion artifacts in CT imaging?
- a) Increase the slice thickness
 - b) Decrease the scan time
 - c) Increase the pitch
 - d) Use higher kVp
13. The 'effective dose' in CT takes into account:
- a) The type of tissue exposed to radiation
 - b) The total radiation absorbed by the body
 - c) Only the X-ray tube voltage
 - d) The patient's weight
14. What does a CT scan of the extremities evaluate?
- a) Heart and lungs
 - b) Bones and joints
 - c) Brain and spinal cord
 - d) Abdominal organs
15. Which of the following is an advantage of CT scans over MRI?
- a) Better soft tissue contrast
 - b) No risk of radiation exposure
 - c) Lower cost
 - d) Shorter scan time
16. What does a "CT myelogram" involve?
- a) Imaging the brain
 - b) Injecting contrast into the spinal canal
 - c) Examining the kidneys
 - d) Assessing bone fractures
17. What does a "CT-guided biopsy" involve?
- a) Removing a tissue sample using surgery
 - b) Using CT imaging to guide needle placement
 - c) Administering contrast agent orally
 - d) measuring blood pressure during the scan

18. What does a CT scan of the neck evaluate?

- a) Brain function
- b) Thyroid gland and lymph nodes
- c) Spinal cord and vertebrae
- d) Muscles and tendons

19. What is the purpose of a CT scan of the liver?

- a) Imaging the kidneys
- b) Assessing bone fractures
- c) Examining abdominal organs
- d) Visualizing blood vessels

20. Which of the following is not typically imaged in a CT scan of the abdomen?

- a) Liver
- b) Pancreas
- c) Heart
- d) Spleen

21. What does a "CT arthrogram" involve?

- a) Imaging the brain
- b) Injecting contrast into a joint
- c) Examining the lungs
- d) Assessing bone fractures

22. What does a "CT cystogram" evaluate?

- a) Brain function
- b) Bladder
- c) Liver
- d) Lungs

23. What does a "CT pulmonary angiogram" focus on imaging?

- a) Brain function
- b) Heart and blood vessels
- c) Liver and kidneys
- d) Muscles and tendons

24. What effect does beam restriction have on the quality of the mammography image?

- a) Less background density
- b) Better penetration of breast
- c) Magnification of small structures
- d) Improved contrast

25. What is full form of PACS?

- a. Picture Automatic and Command System
- b. Phase Archiving and Communication System
- c. Picture Automatic and Communication System
- d. Picture Archiving and Communication System

26. The acceptable level of leakage radiation in properly design protective housing of x-ray tube should be-

- a. More than 100 mR/hr at 1 metre distance
- b. Less than 100 mR/hr at 1 metre distance
- c. Less than 10 mR/hr at 1 metre distance
- d. Less than 1000 mR/hr at 1 metre distance

27. Which of the following is proximal to the carpal bones

- a) Distal interphalangeal joints
- b) Proximal interphalangeal joints
- c) Metacarpals
- d) Radial styloid process

28. The line focus principle expresses the relationship between

- a). Actual and effective focal spot
- b). SID used and resulting density
- c). Exposure given the IR and resulting density
- d). Kilovoltage is used and resulting contrast

29. Any wall that the useful X-ray beam can be directed towards is called a

- a) Secondary barrier
- b) Primary barrier
- c) Leakage barrier
- d) Scattered barrier

30. Which of the following refers to the ability of CT detectors to capture , absorb, and convert x-ray photons in to electrical energy.

- a) Stability
- b). Response time
- c). Dynamic Range
- d). Efficiency

31. The effect of radiation on biological material is dependent on several factors. If the quantity of radiation delivered to a body over a long period of time, the effect

- a) will be greater than if we delivered all at the one time
- b) will be less than if we delivered all at the one time
- c) Has no relation to how it is delivered in time
- d) Is solely dependent on the radiation quality

32. An x-ray imaging system that draws a current of 80A is supplied with 220V. What is the power consumed?

- a) 15.5KW
- b) 17.6KW
- c) 19.6KW
- d) 21.6KW

33. What is the function of a digital detector?

- a) Converts x-ray energy into electrical charge
- b) Produces dark current
- c) Transmits x-ray energy
- d) Displays the image

34. Radiation output from a diagnostic x-ray tube is measured in which of the following units of measurement?

- a) Rad
- b) Rem
- c) Roentgen
- d) Becquerel

35. What is the effect of a stationary grid on contrast and radiation dose?

- a) Both decrease
- b) Contrast increases, Radiation dose decreases
- c) Contrast decreases, Radiation dose increases
- d) Both increase

36. In MRI, which element is most commonly used to create the magnetic field?

- a) Iron
- b) Copper
- c) Aluminum
- d) Superconducting magnets

37. What is the unit used to measure magnetic field strength in MRI?

- a) Newton
- b) Volt
- c) Tesla
- d) Joule

38. The process of aligning the hydrogen nuclei in the body with an external magnetic field is called:

- a) Precession
- b) Excitation
- c) Relaxation
- d) Polarization

39. Which of the following is NOT a type of MRI sequence?

- a) T1-weighted
- b) T2-weighted
- c) PD-weighted
- d) P-value weighted

40. What does the term "T1-weighted" refer to in MRI imaging?

- a) short repetition time and echo time
- b) long repetition time and short echo time
- c) long repetition time and long echo time
- d) short repetition time and long echo time

41. Which tissue type appears dark on T1-weighted MRI image?

- a) Fat
- b) Water
- c) Bone
- d) Muscle

42. Which of the following is NOT an MRI contrast agent?

- a) Gadolinium
- b) Iodine
- c) Iron oxide
- d) Manganese

43. The phenomenon of T2* decay is most relevant in which MRI technique?

- a) Diffusion-weighted imaging
- b) Susceptibility-weighted imaging
- c) Gradient-echo imaging
- d) Spin-echo imaging

44. What is the typical range of the main magnetic field strength used in clinical MRI scanners?

- a) 0.5 - 1 Tesla
- b) 1 - 3 Tesla
- c) 3 - 5 Tesla
- d) 5 - 7 Tesla

45. The process of returning to the equilibrium state after excitation in MRI is known as:

- a) Relaxation
- b) Tumbling
- c) Precession
- d) Saturation

46. The slice thickness in MRI refers to:

- a) The depth of the patient
- b) The width of the imaging plane
- c) The length of the bore
- d) The distance between the magnet and the patient

47. The primary safety concern in MRI is related to:

- a) Ionizing radiation
- b) Electrical shock
- c) Magnetic field interactions
- d) Chemical exposure

48. The process of "phase contrast angiography" in MRI is primarily used to:

- a) Visualize blood flow
- b) Assess tissue perfusion
- c) Evaluate vascular malformations
- d) Measure cerebrospinal fluid flow

49. Which physical property is primarily exploited in MRI?

- a) Electrical resistance
- b) Magnetization of nuclei
- c) Light absorption
- d) Heat conduction

50. Which of the following will result if Developer replenishment is inadequate

- a. Images with excessively high contrast
- b. Images with excessively Low contrast
- c. Images with excessively high Density
- d. Dry, Brittle films

51. The contraction of Heart Chamber is

- a) Systole
- b) Diastole
- c) Hypertension
- d) Dyspnea

52. What number of Breaths per minute represents the average rate of respiration for a normal adult

- a) 8 to 15
- b) 10 to 20
- c) 30 to 60
- d) 60 to 90

53. The plane passes vertically through the body dividing it into left and right halves is termed the

- a) Midsagittal Plane
- b) Midcoronal Plane
- c) Sagittal Plane
- d) Transverse Plane

54. The best way to control voluntary motion is

- a. Immobilization
- b. Careful explanation
- c. Short Exposure time
- d. Physical Restraint

55. Which of the following best demonstrates the cuboid , sinus, tarsi, and tuberosity of the fifth metatarsal

- a. Lateral foot
- b. Lateral Oblique foot
- c. Medial Oblique Foot
- d. Weight Bearing Foot

56. Which of following structure is subject to blowout fracture

- a) Ethmoid Sinuses
- b) Zygomatic arch
- c) Mandibular Condyle
- d) Orbital floor

57. The purpose of filters in a film badge is

- a) To eliminate harmful rays
- b) To improve radiation quality
- c) To Prevent exposure from Alpha particles
- d) To support the film contained within

58. When a Intensifying screen continues to glow after the x-Rays exposures has ended, the screen has ended , the screen is said to process

- a) Fluorescence
- b) Incandescence
- c) Luminescence
- d) Lag

59. The transform violet light a emitted by the PSP into the image seen on the CRT

- a) The photostimulable Phosphor
- b) The scanner / Reader
- c) The ADC
- d) The helium-neon Laser

60. Which of the following pathological condition would require an increase in exposure factors

- a. Pneumoperitoneum
- b. Obstructed Bowel
- c. Renal Colic
- d. Ascities

PART – II

SHORT ANSWER TYPE QUESTIONS

(Answer any 5 out of 8 questions) 5x 6 marks each = 30 marks

61. Discuss the function and types of X-ray detectors used in CT.
62. Explain the basic principles of computed tomography. Include a description of the Hounsfield scale and its significance.
63. Discuss the significance of the Hounsfield scale in CT imaging and how it is used to differentiate various tissues.
64. What are the advantages and Disadvantages Over Dual Source v/s Dual Energy CT.
65. Discuss the factors affect detector efficiency and performance.
66. Explain Window Level & Window Width
67. Explain the Slip Ring Technology and its Function.
68. Draw and level the layout planning of CT scan as per the norms of AERB.

PART- III

LONG ANSWER TYPE QUESTIONS

(Answer any 2 out of 4 questions) 2 x 15 marks each = 30 marks

69. Trace the historical development of CT technology from the first-generation scanners to modern multi-slice and cone-beam CT systems. Highlight the differences in design, functionality, and applications across generations.
70. Explain the concept of radiation dose in CT imaging. Discuss dose measurement units (CTDIvol, DLP) . Why is the ALARA principle important in CT?
71. What are artifacts in CT imaging? Describe common types of artifacts, their physical causes, and strategies for reducing their occurrence.
72. a) Discuss the significance of quality assurance (QA) in CT imaging.
b) Describe the QA tests performed to ensure the optimal functioning of CT systems, including checks for image quality, radiation dose, and mechanical performance.