MALLA REDDY UNIVERSITY

SCHOOL OF ALLIED AND HEALTHCARE SCIENCES

M.Sc RIT - I yr. II Sem

Subject: ADVANCED TECHNIQUE & INSTRUMENTATION OF CT

Subject Code: MR25-2RIT203

Duration: 2 hours Max. Marks:40M

Question bank

Q.No	Questions	Marks	Section	Unit
1	a. Explain the basic principles of Computed Tomography (CT). (3M) b. Describe in detail the role of the data acquisition system (DAS) in image formation. (5M)	**8**	**Section-I**	**1**
2	Explain the first- and second-generation CT scanners.	**8**	**Section-I**	**1**
3	a) Write a short note on the History of CT? (4M) b) Write in detail about the properties of X-rays. (4M)	**8**	**Section-I**	**1**
4	a. Explain the principle and working of multi-slice CT (MSCT). b. Describe detector design, data acquisition, and reconstruction techniques used in MSCT.	**8**	**Section-I**	**1**
5	Write in detail about the first, second, third, and fourth generations of CT scanners with neat diagrams	**8**	**Section-I**	**1**
6	a) Explain in detail about EBCT? (4M) b) Write a brief note on the 7^{th}-generation CT Scanner? (4M)	**8**	**Section-I**	**1**
7	a) Write a short note on single- slice CT? (3M) b) Explain in detail about the 3^{rd} generation CT Scanner? (5M)	**8**	**Section-I**	**1**
8	Explain in detail about the 3^{rd} and 4^{th} generation CT Scanner?	**8**	**Section-I**	**1**
9	Explain the 6th-generation CT Scanner with a neat, labelled diagram. Add a note on their advantages and disadvantages.	**8**	**Section-I**	**1**

10	Describe slip ring technology in CT scanners. Explain its construction, working principle, advantages, and its role in the development of spiral/helical CT.	**8**	**Section-I**	**1**
11	a. Write a short note on the X-ray tube & Patient couch in CT? (4M) b. Explain collimators & filters used in CT? (4M)	**8**	**Section-II**	**2**
12	a. Explain the role of filtration in CT and their types. (3M) b. Describe inherent and added filtration, bow-tie filters, and their importance in patient dose reduction and image quality. (5M)	**8**	**Section-II**	**2**
13	a. Write in detail about recent advancements in CT detector technology. b. Explain the design and advantages of Stellar detectors	**8**	**Section-II**	**2**
14	a. Explain the technical aspects of High-Resolution CT (HRCT). (5M) b. Describe slice thickness, reconstruction algorithms, matrix size, and window settings. (3M)	**8**	**Section-II**	**2**
15	Explain the types of Detectors used in CT?	**8**	**Section-II**	**2**
16	Explain the components of CT scan equipment?	**8**	**Section-II**	**2**
17	a. Explain the design and advantages of Nano-panel prism detectors b. Explain collimators in CT.	**8**	**Section-II**	**2**
18	a. Describe volumetric HRCT and expiratory HRCT. b. Explain the scanning technique, indications, advantages, and clinical significance.	**8**	**Section-II**	**2**
19	Explain CT artefacts in detail. Describe the causes, appearance, and methods of reduction of common artefacts encountered in CT imaging	**8**	**Section-II**	**2**
20	Explain about flat panel detectors and discuss their construction, working principles, advantages, and limitations.	**8**	**Section-II**	**2**
21	What is Image reconstruction? Write a short note on filtered back-projection.	**8**	**Section-III**	**3**
22	Explain in detail about the analytical methods of Image reconstruction?	**8**	**Section-III**	**3**
23	a. Write a short note on windowing in CT? (4M)	**8**	**Section-III**	**3**

	b. Describe the Beam pitch & detector pitch? (4M)			
24	a. Write a short note on pixel, voxel, SFOV& DFOV? (4M) b. Write a short note on window width & window level? (4M)	**8**	**Section-III**	**3**
25	Write in detail about Hounsfield units and mention the CT numbers of the human body organs.	**8**	**Section-III**	**3**
26	Explain the concept of isotropic imaging in CT. Describe its principle, technical requirements, advantages, and clinical applications.	**8**	**Section-III**	**3**
27	Write a note on pre- and post-processing techniques in CT.	**8**	**Section-III**	**3**
28	Write in detail about the Image Display in CT?	**8**	**Section-III**	**3**
29	a) What is a Pitch in a CT scan? (4M) b) How does pitch affect the CT scan? (4M)	**8**	**Section-III**	**3**
30	Explain in detail the image quality in CT?	**8**	**Section-III**	**3**
31	Explain the principle and working of CT fluoroscopy. Describe its clinical applications, advantages, limitations, and radiation safety concerns.	**8**	**Section-IV**	**4**
32	Describe Photon Counting CT (PCCT) in detail. Explain its detector technology, working principle, advantages over conventional CT, and clinical applications.	**8**	**Section-IV**	**4**
33	Compare single-source CT and dual-source CT.	**8**	**Section-IV**	**4**
34	a. Explain 3D CT imaging. b. Describe data acquisition, reconstruction techniques, advantages, and clinical applications of 3D CT.	**8**	**Section-IV**	**4**
35	a. Explain 4D CT imaging. b. Describe the principle, scanning technique, advantages, and applications in oncology and radiotherapy planning in 4D CT.	**8**	**Section-IV**	**4**
36	Explain the principle of SPECT-CT. Describe its components, image acquisition process, advantages, and clinical applications.	**8**	**Section-IV**	**4**
37	Explain the principle of PET-CT. Describe its components, image acquisition process, advantages, and clinical applications.	**8**	**Section-IV**	**4**
38	Write in detail about artificial intelligence (AI) and	**8**	**Section-IV**	**4**

	intelligence in CT imaging.			
39	Write a note on Single-source CT. Write their advantages and disadvantages.	**8**	**Section-IV**	**4**
40	Write a note on Dual-source CT. Write their advantages and disadvantages.	**8**	**Section-IV**	**4**
41	a. Define CTDI and explain its significance. b. How is DLP (Dose Length Product) calculated in CT?	**8**	**Section-V**	**5**
42	a. How does pitch influence the radiation dose in helical CT? b. Explain the effect of tube current (mA) and tube voltage (kVp) on radiation dose.	**8**	**Section-V**	**5**
43	a. Write a short note on dose reduction in pediatric CT? (4M) b. Explain Automatic Exposure Control? (4M)	**8**	**Section-V**	**5**
44	Explain the Accuracy of the X-ray tube voltage, Linearity of the Tube current, & Low contrast resolution test QA test in CT?	**8**	**Section-V**	**5**
45	Explain in detail about Quality assurance in CT.	**8**	**Section-V**	**5**
46	Explain in detail about CT room layout.	**8**	**Section-V**	**5**
47	a. Explain the factors affecting the dose in Helical CT. b. Write a note on Care and maintenance in CT equipment.	**8**	**Section-V**	**5**
48	Explain in detail the role of the CT technologist in reducing patient dose in CT?	**8**	**Section-V**	**5**
49	Write a note on the radiation protection principle in CT.	**8**	**Section-V**	**5**
50	Write a note on Shielding and Safety considerations in CT.	**8**	**Section-V**	**5**