



SCHOOL OF HEALTHCARE SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST -I
FALL SEMESTER 2025-2026

SLOT: F1+TF1

Programme Name & Branch: B.Tech. Health Sciences and Technology

Course Code : BHST209L

Course Name: Principles of Bio-Medical Imaging and its Clinical Applications

Faculty Name(s): Dr. Raunak Kumar Das

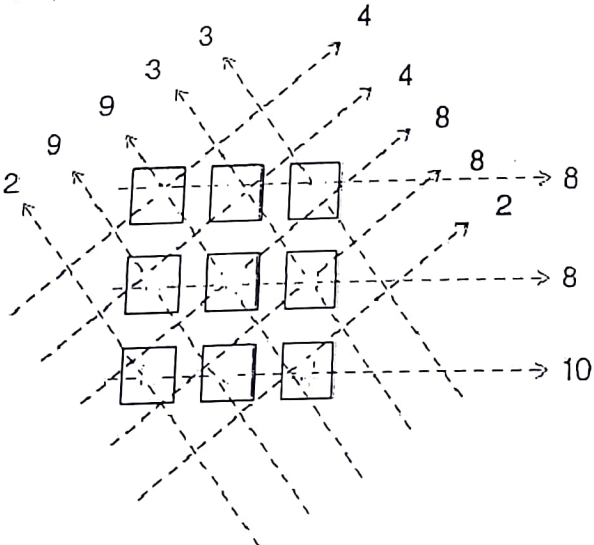
Class Number(s): VL2025260101034

Date of Examination: 22/08/2025

Exam Duration : 90 minutes

Maximum Marks: 50

General instruction(s): Answer all questions

Q. No	Question	Marks									
1.	Bacteria? In my stomach? Helicobacter pylori is a spiral bacterium that lives in the stomach and duodenum (section of intestine just below stomach). The inside of the stomach is exposed to gastric juice and is protected by a thick layer of mucus that covers the stomach lining. H. pylori live in this mucous lining. It is responsible for peptic ulcer disease and chronic gastritis and is thought to be a risk factor for stomach cancer. About half the world's population is infected with H. pylori, most living in developing countries. A new low-cost diagnostic test, the local urease test (LUT), has been developed to test for the presence of the bacterium. The performance of LUT in actual trials is presented in the table below: <table><thead><tr><th></th><th>Cases (Infected)</th><th>Controls (NonInfected)</th></tr></thead><tbody><tr><td>+ LUT</td><td>126</td><td>1</td></tr><tr><td>- LUT</td><td>0</td><td>84</td></tr></tbody></table> Based on the table given above find the sensitivity, specificity, accuracy and precision of the test?		Cases (Infected)	Controls (NonInfected)	+ LUT	126	1	- LUT	0	84	10
	Cases (Infected)	Controls (NonInfected)									
+ LUT	126	1									
- LUT	0	84									
2.	 Using back projection method please find the value of the 3 x 3 grid in the centre of this figure. The attenuation of the X-ray from three different angles is depicted.	10									



VIT

Vellore Institute of Technology
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3.	a) What fraction of 140 keV x-rays incident upon a 0.5 mm thick lead apron will be transmitted? The mass absorption coefficient of lead for 140 keV x-rays is: $\mu_m = 2.0 \text{ cm}^2 \text{ g}^{-1}$ (5 marks) b) How thick would the lead shielding in a wall of an x-ray experimental laboratory have to be to reduce the intensity of 8.0 keV x-rays to 1% of its original value? The mass absorption coefficient of lead for 8.0 keV x-rays is: $\mu_m = 232 \text{ cm}^2 \text{ g}^{-1}$ (5 marks)	10
4.	a) An abdominal radiograph uses 1000 photons to expose a film with an area of 0.15 m^2 ($1.5 \times 10^{-1} \text{ m}^2$ or 1500 cm^2) during an exposure time of 0.1 second. All photons have energy of 50 keV. Find the photon fluence, the photon flux, the energy fluence. (5 marks) b) What are the limitations of conventional radiography? (5 marks)	10
5.	Discuss bremsstrahlung radiation and the two primary methods of X-ray interactions in diagnostic radiology.	10