MANIPAL ACADEMY OF HIGHER EDUCATION
(Deemed University)

SECOND YEAR B.Sc. N.M.T. DEGREE EXAMINATION – JUNE 2006

SUBJECT: FUNDAMENTALS OF ELECTRONICS AND NUCLEAR MEDICINE INSTRUMENTATION
Wednesday, June 07, 2006

Time: 3 Hrs.   Max. Marks: 80

✍ ANSWER SECTION – A AND SECTION – B IN TWO SEPARATE ANSWER BOOKS.

SECTION – A : FUNDAMENTALS OF ELECTRONICS : 30 MARKS

✍ Answer all questions. Each question carries FIVE marks.

1.   In the circuit 1.1 shown determine the applied voltage V.

2.   What is voltage regulator? Explain the zener diode as a voltage reference.

3.   Write short note on:
3A. Coincidence circuit.
3B. Dynodes.

4.   Explain the classification of materials based on energy band theory.

5.   Explain how an op-amp can be used for the following application with circuit diagram and expression.
5A. Inverting amplifier.
5B. Voltage follower.

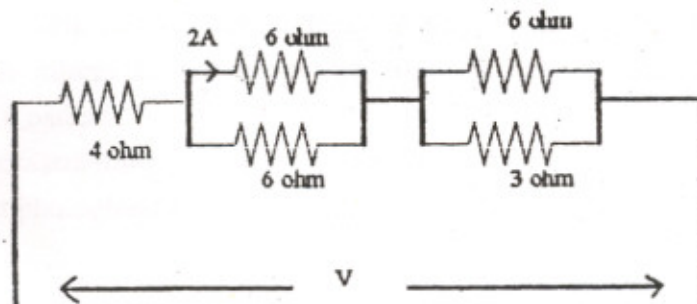6.   Define NAND, OR, EX_NOR gates. Draw the symbol and write truth table.

Fig 1.1

SECTION – B: NUCLEAR MEDICINE INSTRUMENTATION: 50 MARKS

7.   Describe the working principle of Rectilinear Scanner with the help of a block diagram.

(20 marks)

8.   What are the Quality Control parameters of a scintillation camera?

(20 marks)

9.   Answer for any TWO:
9A. Multi Channel Analyzer
9B. Photo Multiplier Tube
9C. Semiconductor Detectors

(5×2 = 10 marks)

✍ Answer Section – 'A' and Section – 'B' In Two Separate Answer Books.

SECTION – A : RADIATION CHEMISTRY : 30 MARKS

1. Write short note on **SIX**:
1A. Oxidation Reduction Reactions.
1B. Atomic weight and Molecular weight.
1C. Hydrogen Ion Concentration.
1D. Valency.
1E. Rutherford Model of atomic structure.
1F. Solute.
1G. Molarity.

(5×6 = 30 marks)

SECTION – B : RADIATION PHYSICS : 50 MARKS

2 **Answer any TWO:**
2A. Give the equation for radioactive decay. A vial containing Tc- 99m is labelled '75kBq/ml at 8 am'. What volume should be withdrawn at 4 pm on the same day to prepare an injection of 50 kBq for a patient?
2B. How is Bremsstrahlung produced? Write about the factors its production depends upon.
2C. Write about photoelectric effect. Explain absorption edges.

(5×2 = 10 marks)

3. **Answer the following:**
3A. Write a short note on:
   i)   PMT   ii)   Semiconductor detector
   iii) Scintillation detector   iv)   Quenching- Liquid Scintillation detector

(5×4 = 20 marks)

3B. State the postulates of Bohr regarding his atom model. Obtain the expressions for the radius and the electron energy of the nth orbit

(20 marks)

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SUBJECT: RADIOPHARMACY

Friday, June 09, 2006

Time: 3 Hrs.   Max. Marks: 80

1. What is the significance of Biological QC tests? Explain them.

                                                                 (2+18 = 20 marks)

2. Differentiate between manual and automatic methods of 99m Tc production. With a neat and labeled diagram explain the working of a dry generator.

                                                                 (12+8 = 20 marks)

3. Write on radiopharmaceuticals and the different methods of mechanism of localization of radiopharmaceuticals with examples.

                                                                 (20 marks)

4. Write short notes on any **FOUR**:

4A. Gallium.

4B. Static renal agents.

4C. Radioactive Spillage.

4D. Ultra short lived generators.

4E. Isotope dilution principle.

                                                                 (5×4 = 20 marks)