Roll No: ----------

UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

Program: MTech Nuclear Science and Technology	**Semester – : II**
Subject (Course) : Radiation Technology for Industrial and Medical Applications and Material Analysis	**Max. Marks : 100**
Course Code : NSAT 7006	**Duration : 3 Hrs**
No. of page/s : 2	

Section A

Answer all the 5 questions. Each question carries 4 marks

1. Write the industrial applications of radiotracers
2. Describe how a gamma camera works
3. Explain the principle of PIXE
4. Write the advantages and disadvantages of WD-XRF and ED-XRF
5. List the applications of neutron activation analysis

Section B

Answer all the 4 questions. Each question carries 10 marks

6. Describe briefly the how radiotracers are employed in leak detection, oil field investigations, agriculture and in industry

   or

   A typically gamma-ray detector efficiency is ε ~ 0.1 and a minimum count rate is CR_{min} ~ 30 min^{-1} = 0.5 s^{-1}. For ^{14}C ($T_{1/2}$ = 5730 years = 1.18 x 10^{11} s) find the minimum detectable mass of ^{14}C in a sample
7. Explain the principle of RBS technique and write the equations for the kinematic factor, the differential cross section and energy loss
8. Write the basic principles of PET and its applications
9. List the typical Ion beams and Incident energies used in various IBA techniques

Section C

Answer both the questions. Each question carries 20 marks

10. Describe the basic principles of neutron logging and how it is used to measure the amount of hydrogen (porosity index) in a formation

or

Prove that the contribution to the intensity of the primary fluorescence of element *i* is given by

$$I_i = \{[(I_0\ C_i\mu_i\ Q)\ (\Omega/4\pi)]/(\mu_s + \mu_{s,Ei})\}\{1 - \exp\ [-\rho\ h\ (\mu_s + \mu_{s,Ei})]\}$$

11. Explain the principle, sources, types and applications of brachytherapy in cancer treatment

Roll No: ----------

UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

Program: MTech Nuclear Science and Technology	**Semester – : II**
Subject (Course) : Radiation Technology for Industrial and Medical Applications and Material Analysis	**Max. Marks : 100**
Course Code : NSAT 7006	**Duration : 3 Hrs**
No. of page/s : 2	

Section A

Answer all the five questions. Each question carries four marks

1. What is a nuclear gauge? List the types of nuclear gauges based on mode of operation and on type of radioactive source used
2. Explain the working of RTG
3. Define the term effective half-life of a radiopharmaceutical
4. List the typical applications of XRF
5. Explain the principle of nuclear resonance analysis method of elemental analysis

Section B

Answer all the four questions. Each question carries 10 marks

6. List the advantages and disadvantages of radiography using X-rays and gamma rays

   or

   Explain the image contrast one can get by using X-rays and gamma rays and neutrons as NDT probes
7. Write the basic principles of CT and how it works
8. What are the main components of a MRI Scanner and write their functions
9. Write the applications of neutron activation analysis method of elemental analysis, its advantages and disadvantages

Section C

Answer both questions. Each question carries 20 marks

10. Describe i) external radiation therapy, ii) Internal radiation therapy and iii) boron neutron capture therapy employed in cancer treatment

11. Explain the principle of elastic recoil detection analysis and its applications

or

Describe the principle of nuclear reaction analysis and its applications

---