



MBT-003-1204002 Seat No. _____

M. Sc. (Physics) (Sem. ?) (CBCS) Examination

April / May - 2018

**CT - 12 : Experimental Techniques with
Interdisciplinary Applications**

Faculty Code : 003

Subject Code : 1204002

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

Instructions : (1) All questions are compulsory.

(2) All questions carry equalmarks.

1 Answer the following questions: Any **Seven** out of Ten : **14**

(i) Find the λ_{SWL} for an X-ray tube operating at a potential difference of 35 kV.

(ii) State the principle of scintillation based detectors.

(iii) Complete the following nuclear reaction for neutron source a $a + {}^9\text{Be} \rightarrow \dots\dots\dots + {}^1_0\text{n}$

(iv) Write the full forms of XFS and ESCA.

(v) State the general rules to predict the spin of a nucleus.

(vi) State: How two different energy states are produced in NMR and ESR spectroscopy?

(vii) What do you mean by mass spectrum?

(viii) What do you mean by emission spectra?

(ix) Why recoil energy is very negligible in case of solid?

(x) What is neutron diffraction?

- 2** Write Any **Two** :
- (a) How the electromagnetic radiation is generated? State the principle of production of X-rays. Discuss various parts that are needed in production of X-rays. **7**
 - (b) Discuss the interaction of uncharged radiation with matter. **7**
 - (c) Write the principle of X-ray absorption technique. Discuss the non-dispersive X-ray absorption meter. **7**
- 3** Answer the following questions: ALL ARE COMPULSORY :
- (a) Write the principle of ionization based detectors. Discuss the GM detector in detail. **7**
 - (b) Explain: How the Mossbauer spectrum is modified due to Quadrupole interaction and magnetic hyperfine interaction. **7**
- OR**
- 3** Answer the following questions: ALL ARE COMPULSORY :
- (a) Discuss the shielding effect in Nuclear Magnetic Resonance Spectroscopy. **7**
 - (b) Discuss the hyperfine splitting of the ESR spectrum. **7**
- 4** Write Any **Two** :
- (a) What is mass spectrometry? Discuss its theory. **7**
 - (b) What do you mean by a monochromator? Discuss its types. **7**
 - (c) Discuss the requirements for absorption of IR radiations. **7**
- 5** Write notes on any **two** : **14**
- (i) Radiation sources.
 - (ii) Electron spectroscopy for chemical analysis.
 - (iii) ^{57}Fe Mossbauer Spectroscopy.
 - (iv) Mossbauer spectrometer.
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