

MFS

2007

PHYSICS (Optional)

000733

भौतिकशास्त्र ( वैकल्पिक )

Time : 3 hours

Maximum Marks : 200

- Note :**
- In all attempt five questions.
  - Question No. 1 is compulsory.
  - Of the remaining Questions, Attempt **any four** by selecting **one question** from each section.
  - Draw structures, diagrams wherever required.
  - Numbers of optional questions upto the prescribed number in the order in which questions have been solved, will only be assessed and excess answers of the question/s will not be assessed.
  - Candidate should not write roll number, any names (including their own), signature, address or any indication of their identity anywhere inside the answer book otherwise he will be penalised.

1. Answer **any four** of the following :

40

- Define :
  - Dot Product
  - Cross Product
  - Vector triple product
  - Divergence of a vector
  - Curl of a vector
- What is an eyepiece ? Explain. Give any three advantages and three names of eyepieces.
- Explain phenomenon of reverberation and state factors affecting the acoustics of buildings.
- What are advantages of Junction FET over conventional transistor ?
- A car emitting sound of frequency 200 Hz is moving away from a stationary observer and towards a rigid flat wall. The velocity of the car is 5 m/s. Calculate the number of beats heard per second by the observer. The velocity of sound in air is 350 m/s.

P.T.O.

## SECTION - A

2. Answer the following sub-questions :

- (a) Explain the terms : 20
- (i) Stress
  - (ii) Strain
  - (iii) Young's Modulus
  - (iv) Modulus of rigidity

Show that work done per unit volume of stretching the wire is equal to  $\frac{1}{2}$  (stress  $\times$  strain).

- (b) State and explain Zeroth, First and Second law of thermodynamics giving suitable examples. 20

3. Answer the following sub-questions :

- (a) Describe in brief : Damped vibrations and Forced vibrations. Explain the concept of resonance with example. 20
- (b) Explain in detail platinum wire thermometer. What are advantages of platinum wire thermometer over gas thermometer. 20

## SECTION - B

4. Answer the following sub-questions :

- (a) With neat diagram, explain construction and working of He-Ne gas laser. 10
- (b) Explain the terms : 20
- (i) Electric intensity ( $\vec{E}$ )
  - (ii) Dielectric polarisation ( $\vec{P}$ )
  - (iii) Electric displacement ( $\vec{D}$ )
  - (iv) Dielectric Constant (K)
  - (v) and Electric susceptibility ( $\chi$ ).

Obtain relation between Electric displacement ( $\vec{D}$ ), Electric intensity ( $\vec{E}$ ) and Electric polarisation ( $\vec{P}$ )

- (c) Briefly describe Diamagnetism, Paramagnetism and Ferromagnetism. Give examples of each. 10

5. Answer the following sub-questions :

- (a) Explain the concepts : 10  
(i) Interference of light  
(ii) Diffraction of light
- (b) State and explain Kirchhoff's laws. Apply them to deduce the condition of balance in a Wheatstone's Bridge. 20
- (c) State principle of electric tube (fluorescent tube) and explain working of it with neat diagram. 10

### SECTION - C

6. Answer the following sub-questions :

- (a) "Pauli's exclusion principle plays important role in the construction of periodic table". Comment. 20
- (b) With a neat diagram, explain construction and working of Geiger-Muller Counter. 20

7. Answer the following sub-questions :

- (a) What is the difference between Optical Spectra and X-ray Spectra ? Explain Mosley's law. Describe its application. 20
- (b) Write a note on "Production of electricity from fission reactor". 20

### SECTION - D

8. Answer the following sub-questions :

- (a) State and explain Bragg's law in Crystallography. Give an account of an analysis of cubic crystal structure by Debye-Scherrer method (Powder Method). 20
- (b) Describe following logic gates with symbol and truth table. 20  
(i) AND gate  
(ii) OR gate  
(iii) NOR gate  
(iv) Ex-OR gate  
(v) NAND gate

P.T.O.

9. Answer the following sub-questions :

- (a) Distinguish between metals, semiconductors and insulators on the basis of their energy band structure.  
What do you understand by 'Hall Coefficient' ? Explain the Hall effect in a material. 20
- (b) What is an Operational Amplifier ? State the characteristics of an ideal OP-AMP.  
Explain OP-AMP as an  
(i) Adder,  
(ii) Integrator. 20

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