

Roll No. _____

2E1023

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B. Tech. II Semester (Main/Back) Examination, June/July-2011
Common to all Branches of Engineering

Physics- II

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

Instructions to Candidates:

Attempt overall **five questions**, selecting **one question from each unit**. All questions carry **equal marks**. (Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

Unit - I

1. A) i) Write down schrodinger's equation for a particle of mass 'm' trapped in a 3-Dimensional Box of side 'a'. Solve it for energy eigen values and eigen functions.
- ii) Find the lowest energy of a Neutron confined to a nucleus of size 10^{-14} meter.
- iii) Write a short note on Quantum Mechanical Tunneling. (8+4+4=16)

OR

- B) i) Define the fermi energy. Write down the expression for the Fermi-Dirac distribution law. also derive an expression for the Fermi Energy for the system of particles.
- ii) Calculate the Fermi Energy and Fermi velocity for free electron gas in Silver. Given the number of free electrons per unit volume in silver is 5.8×10^{28} per meter cube.
- iii) Write a short note on sommer fields free electron gas model. (8+4+4=16)

Unit - II

2. A) i) Explain the essential requirements for producing laser action. With neat and clean Diagram, Explain the working of He-Ne laser. How is population inversion achieved in this type of laser.

ii) Write short notes on the following:

- a) Q - Switching.
- b) Mode- locking.

(8+8=16)

OR

B) i) Give two fundamental differences between a hologram and a photograph. Describe the method of recording the Hologram and reconstruction of image from it.

ii) Write short notes on the following :

- a) Holographic Microscopy.
- b) Semiconductor laser.

(8+8=16)

Unit - III

3. A) i) What do you mean by Numerical Aperture of an Optical fibre. Find the Expression for the Numerical aperture of a step index fibre.

ii) Compare the maximum angle of acceptance and Numerical aperture of two fibres. Characterized by core and cladding index n_1 & n_2 respectively

a) $n_1 = 1.6, n_2 = 1.5$

b) $n_1 = 2.1, n_2 = 1.5$

(10+6=16)

OR

B) i) What do you mean by spatial and Temporal coherence, for propagating waves?

Show that visibility is a measure of degree of coherence.

ii) Explain the use of optical fibres in

- a) Fibroscope
- b) Sensor
- c) Optical gyroscope

(10+6=16)

Unit - IV

4. A) i) Explain the construction and working of a G.M. counter, give its important applications. How quenching is achieved in this counter.

ii) What are the advantages of proportional counter over G.M. counter

(12+4=16)

OR

- B) i) What is dielectric, dielectric constant and dielectric polarization. How shall you experimentally measure dielectric constant by schering method. (8+8=16)
- ii) The capacity of a capacitor is increases by 120% when filled completely by dielectric find its dielectric constant (12+4=16)

Unit - V

5. A) i) State Ampere's law in Integral and differential form. Why it is modified by Maxwells.
- ii) Derive Maxwells equation for a linear-isotropic conducting medium (8+8=16)

OR

- B) i) What do you mean by divergence of a vector field? Explain its physical significance.
- ii) Deduce Maxwell's equations for free space and prove that the electromagnetic waves are Transverse.
- iii) If $\vec{A} = x^2 z \hat{i} - 2y^3 z^2 \hat{j} + xy^2 z \hat{k}$, find the values of
- a) $\text{div } \vec{A}$
- b) $\text{Curl } \vec{A}$
- at a point (2, 2, 2) (4+8+4=16)