

Total No. of Questions : 8]

SEAT No. :

P1965

[Total No. of Pages : 3

F.E. (Semester - II)
ENGINEERING PHYSICS
(2012 Pattern)

Time : 2 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer all questions.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

Constants: 1) $h = 6.63 \times 10^{-34} \text{ J.s}$

2) $m_e = 9.1 \times 10^{-31} \text{ kg}$

3) $e = 1.6 \times 10^{-19} \text{ C}$

4) $c = 3 \times 10^8 \text{ m/s}$

- Q1)* a) Derive the equation of path difference between reflected rays when monochromatic light of wavelength ' λ ' falls with angle of incidence ' i ' on the uniform thickness film of refractive index ' μ '. Write the conditions of maxima and minima. [6]
- b) Explain how cavitation technique can be used for cleaning purpose. [3]
- c) Calculate the intensity level of a fighter plane just leaving the runway having a sound intensity of about 100 W/m^2 . Given that threshold intensity = 10^{-12} W/m^2 . [3]

OR

- Q2)* a) What is magnetostriction effect? With the help of neat circuit diagram, explain the working of magnetostriction oscillator to obtain the ultrasonic waves. [6]

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- b) Define diffraction of light. Draw intensity distribution pattern obtained because of diffraction of light at a single slit and label the significant points in the same. [3]
- c) In a grating, the angle of diffraction for the second order principal maximum for the light of wavelength 5×10^{-5} cm is 30° . Calculate the number of lines per centimeter of the grating surface. [3]
- Q3)** a) Explain double refraction and hence give Huygen's theory of double refraction. [6]
- b) Explain Fermi-Dirac distribution function specifying the meaning of each term in it. [3]
- c) A slab of silicon 2 cm in length 1.5 cm wide and 2 mm thick is applied with magnetic field of 0.4 T along its thickness. When a current of 75 A flows along the length, the voltage measured across the width is 0.81 mV. Calculate the concentration of mobile electrons in silicon. [3]

OR

- Q4)** a) Derive the expression for the conductivity of intrinsic and extrinsic semiconductor. [6]
- b) What is difference between normal photography and holography? Why lasers are used to record hologram? [3]
- c) Explain only the pumping process in Ruby laser and He-Ne laser. [3]
- Q5)** a) State and explain Heisenberg's uncertainty principle. Prove the same for pair of variables energy and time. [6]
- b) Explain in brief, working of Scanning Tunneling Microscope (STM). [4]
- c) What accelerating potential would be required for a proton with zero initial velocity to acquire a velocity corresponding to its de-Broglie wavelength of 10^{-10} m. [Given: $m_p = 1.67 \times 10^{-27}$ kg]. [3]

OR

- Q6)** a) Deduce Schrodinger's time independent wave equation. [6]
b) Define phase velocity of a matter wave. Show that phase velocity of matter wave is greater than velocity of light. [4]
c) Starting from $\lambda = \frac{h}{mv}$, obtain $\lambda = \frac{h}{\sqrt{2mE}}$, where E is KE of the particle. [3]
- Q7)** a) Discuss the electrical and structural properties of nano-materials. [6]
b) State Meissner effect. Why materials in superconducting state exhibit diamagnetism. [4]
c) State any six applications of superconductors. [3]

OR

- Q8)** a) What is superconductivity? Explain BCS theory of superconductors. [6]
b) Explain any one physical method of synthesis of nano-particles. [4]
c) Explain any one application of nanotechnology. [3]

