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) $h = 6.63\times10^{-34}$ *J.s*

2) $m_e = 9.1\times10^{-31}$ *kg*

3) $e = 1.6\times10^{-19}$ *C*

4) $c = 3\times10^{8}$ *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: $m_p = 1.67\times10^{-27}$ 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]**