B.E. / B. Tech (Full Time) DEGREE EXAMINATION, NOV/ DEC.2013.

COMMON TO ALL BRANCHES

FIRST SEMESTER

PH 8151 – ENGINEERING PHYSICS
(Regulation 2012)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A – (10 x 2 = 20 Marks)

1. What are the advantages of I – shape girders?
2. A load of 2 kg produces an extension of 1 mm in a wire of 3 m length and 1 mm diameter. Calculate the Young's modulus of the wire.
3. How can SONAR be used to find the depth of the sea?
4. An auditorium is in a cylindrical shape with diameter 20m and height 6 m. The absorption coefficient of the walls, ceiling and the floor are 0.025,0.02 and 0.5 respectively. Calculate the reverbation time for the auditorium.
5. State the second law of thermodynamics.
6. A heat engine is operating between ice and boiling water. Calculate its efficiency.
7. Write the Einstein coefficients of stimulated absorption and spontaneous emission. What are the significances?
8. Calculate the numerical aperture and acceptance angle of a fiber having core refractive index 1.50 and the cladding refractive index 1.45
9. Define space lattice, unit cell and lattice parameters.
10. Explain briefly the Burger vectors.

PART B – (5 x 16 = 80 Marks)

11. (i) What is magnetostriction effect? Explain with neat diagram, the generation of ultrasonic waves using the magnetostriction oscillator. (12)

(ii) A quartz crystal of thickness 1.0 mm is vibrating at resonance and the vibration produces ultrasonic waves which are used in the acoustic grating experiment. (Young's modulus of quartz is 79 GPa and its density is 2650 kg/m^3). Calculate the velocity of ultrasonic waves in the liquid in the acoustic grating experiment using the following data: Wave length of the light used is 600 nm. Angle of diffraction for the first order diffracted beam is 5°. (4)

12. (a)(i) One end of a rectangular bar of iron is fixed and load is applied to the other end. Drive the expression for the depression at the free end. (12)

(ii) A uniform rectangular bar of 1 m long, 2 cm breadth and 4mm thickness is supported on its flat face symmetrically on two knife edges 80 cm apart. If loads of 250g are hung from the two ends, calculate the radius of the curvature of the bar in equilibrium position. Young's modulus of the materials is 9 GPa. (4)

OR

(b)(i) Derive an expression for the twisting couple in a hallow cylinder. (12)

(ii) A wire of length 1 m and diameter 1mm is clamped at one end of its ends. Calculate the couple required to twist the other end by 90°. Given the rigidity modulus of the materials is 28GPa. (4)

13. (a)(i) Describe with theory the Lee's disc method of determination of thermal conductivity of a bad conductor. (12)

(ii) A copper rod 19 cm long and 1 cm diameter is thermally insulated is heated at one end through 100°C while the other end is kept at 30°C. calculate the amount of heat which will flow in 10 min along the way. Thermal conductivity of copper is 380W/m/K. (4)

OR

(b)(i) Explain the working of the Otto and the Diesel engines. Why is Diesel engine more efficient than Otto engine? Why is the Otto engine known as four stoke engine. (12)

(ii) A quantity of heat ΔQ is transferred from a large heat reservoir at temperature T_1 to another large heat reservoir at temperature T_2 required for spontaneous transfer($T_1 > T_2$). The heat reservoirs are infinite capacity so that there is no observable change in their temperature. Show that the entropy of the entire system has increased. (4)

14. (a)(i) Describe in detail the Michelson Interferometer and explain the formation of the fringes on it. Discuss how this interferometer is used to find the thickness of a thin transparent sheet. (12)

(ii) An air-wedge is formed using two glass plates each of length 5 cm and thin insulation coated wire. The wave length used is 589 nm. 100 fringes are formed with insulation on the wire and 200 fringes are formed when the insulation is removed. Calculate the thickness of the insulation coated on the wire. (4)

OR

(b)(i) Explain the modes of vibration of CO_2 molecule. Describe in detail the construction and working of CO_2 laser with necessary diagram. (12)

(ii) For a heterojunction semiconductor laser, the band gap of the semiconductor used is 1.44 eV. By doping, the band gap of the semiconductor is increased by 0.2 eV. Calculate the change in the wave length of the laser. (Plank's constant is 6.626×10^{-34} JS and the velocity of light is 3×10^8 m/s) (4)

15. (a)(i) Discuss in detail a suitable method to grow single crystals of semiconducting materials. (12)

(ii) Metallic Iron changes from BCC to FCC at 910°C and corresponding the atomic radii vary from 1.258 Å to 1.292 Å. Calculate the percentage volume change during this structural change. (4)

OR

(b)(i) Define packing factor. Deduce c/a ratio and packing factor for HCP structure. (12)

(ii) A compound AB is simple cubic structure (like CsCl) in which the atom A is at the corners and the atom B is at the centre of the unit cell. The radius of the atom A is double that of atom B. calculate the packing factor. (4)