Model Question Paper-2 with effect from 2018-19
(CBCS Scheme)

USN | | | | | | | | | | |

18PHY12/22

First/Second Semester B.E.Degree Examination
Engineering Physics
(Common to all Branches)

Time : 3 hrs Max. Marks: 100

Note: 1. Answer FIVE full questions, choosing ONE full question from each module.

2. Physical constants: Speed of light $c = 3 \times 10^{8}$m/s; $h = 6.625 \times 10^{-34}$JS; $k = 1.38 \times 10^{-23}$J/K; $N_A = 6.02 \times 10^{63}$/Kmole; $m_e = 9.1 \times 10^{-31}$kg; $e = 1.6 \times 10^{-19}$C.

Module – 1

1 a. Starting form Hookes' law derive the differential equation for SHM. Explain the Characteristics of SHM. **(7 marks)**

b. With a neat diagram explain the construction and working of Reddy tube. Mention any four applications of Shock waves **(10 marks)**

c. A mass of 4.3gm is attached to a spring of force constant 17N/m. This mass spring system is executing SHM. Find the frequency of the external force which excites resonance in the system. Ignore the mass of the spring. **(3 marks)**

OR

2 a. State and explain laws of conservation of mass, energy and momentum. **(6 marks)**

b. What are damped oscillations? Derive the expression for decaying amplitude and hence discuss the case of critical damping **(10 marks)**

c. A 20 gm oscillator with a natural frequency 10rad/s is vibrating in damping medium. The damping force is proportional to the velocity of the vibrator. If the damping coefficient is 0.17 how does the oscillation decays? **(4 marks)**

Module-2

3. a. Explain tensile stress and compressive stress. What are the engineering importances of elastic materials? **(6 marks)**

b. Define lateral strain, linear strain and Poisson's ratio. Obtain the expression for Poisson's ratio **(10 marks)**

c. What are torsional oscillations? Give the expression for time period of torsional oscillations. Mention the applications of torsional oscillations **(5 marks)**

d. A wire of length 2m and radius 2mm is fixed to the center of a wheel. A torque of magnitude 0.0395Nm is applied to twist the wire. Find the rigidity modulus of the wire if the angular twist is 0.038rad **(4 marks)**

OR

4. a. Define bending moment. Derive the expression for bending moment in terms moment of inertia. **(8 marks)**

b. Derive the relation between bulk modulus (K), Young's modulus (Y) and Poisson's ratio. What are the limiting values of Poisson's ratio? **(8 marks)**

c. A brass bar of length 1m, area of cross section 0.01m^2 is clamped horizontally at one end. A weight of 1kg is applied at the other end. What is the depression produced (Young's' modulus is 9.78 x 10^{10} Nm^2 **(4 marks)**

Module-3

5. a. Describe the concept of divergence. What is its physical significance? Derive Gauss divergence theorem **(9 marks)**
   b. With neat diagrams explain different types of optical fiber. Define V number **(7marks)**
   c. A coil of mean radius 8cm and having 100 turns carries current of 10A. Calculate the magnetic field produced at the center of the coil and at a point on the axis at a distance 4cm from the center **(4marks)**

OR

6. a. With the help of Block diagram, explain point to point communication using optical fiber. Mention the merits and de merits of optical fiber communications **(10marks)**
   b. What is displacement current?. Derive the expression for displacement current **(6marks)**
   c. An optical fiber has core refractive index 1.5 and clad refractive index 3% less than that of core. Calculate NA, angle of acceptance, and internal critical angle **(4marks)**

Module – 4

7. a. Staring from Schrodinger's time independent wave equation, derive the expression for energy eigen value and eigen function for an electron present in 1-d potential well of infinite depth. (**10 marks)**
   b. What is a laser range finder? Give the qualitative explanation of construction and working of laser range finder **(6 marks)**
   c. An electron is trapped in a 1-D potential well of infinite height and width of 0.1nm. Calculate the energy required to excite it from its ground state to fifth excited state **(4 marks)**

OR

8. a. Explain the terms (a) spontaneous emission, (b) stimulated emission (c) population inversion (d) active medium and (e) resonance cavity **(10 marks)**
   b. What are the properties of a wave function? Give the qualitative explanation of Max Born's interpretation of wave function **(6 marks)**
   c. A laser operating at 632.8nm emits 3.182×10^{16} photons per second. Calculate the output power of the laser if the input power is 100 watt. Also find the percentage power converted into coherent light energy **(4 marks)**

Module – 5

9. a. Give the assumptions of quantum free electron theory. Discuss two success of quantum free electron theory **(8 marks)**
   b. What are dielectrics? Give the relation between dielectric constant and polarization. Discuss solid, liquid and gaseous dielectrics with one example for each. **(8 marks)**
   c. Define Fermi temperature. Calculate Fermi temperature for a metal whose Fermi energy is 7eV **(4 marks)**

OR

10. a. Describe Fermi level in intrinsic semiconductor and hence obtain the expression for Fermi energy in terms of energy gap of intrinsic semiconductor **(8marks)**
    b. Give a brief account for Fermi-Dirac distribution theory. Obtain the expression for Fermi energy at 0 K **(8marks)**
    c. The conductivity and Hall coefficient of an n-type semiconductor are 112/Ωm and $1.25 \times 10^{-3} m^3/C$ respectively. Calculate the charge carrier concentration and electron mobility **(4 marks)**