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06PHY12/22

First / Second Semester B.E. Degree Examination, Dec 08 / Jan 09
Engineering Physics

Time: 3 hrs. Max. Marks:100

Note : *1. Answer any FIVE full questions, selecting atleast two questions from each Part.*
2. Answer all objective type questions only in first and second writing pages.
3. Answer for objective type questions shall not be repeated.

Physical Constants : Electron mass $m = 9.11\times 10^{-31}$ kg.
Electron charge $= 1.6\times 10^{-19}$C, velocity of light $C = 3\times 10^{8}$m/s
Planks constants $h = 6.63\times 10^{-34}$J.S. Avagadros number $N = 6.025\times 10^{28}$/K mol
Permitivity of vaccum $\epsilon_0 = 8.85\times 10^{-12}$F/m , Boltzman constant $k = 1.38\times 10^{-23}$ J/K.

PART – A

1 a. 1) The debroglie wave length associated with an electron of mass m and accelerated by a potential v is

i) $\frac{h}{\sqrt{2mve}}$ ii) $\frac{\sqrt{2mve}}{h}$ iii) $\frac{h}{vem}$ iv) $\frac{h}{2vem}$.

2) Davison and Gelmer were the first to demonstrate :
i) The straight line propogation of light ii) The diffraction of Photons
iii) The effective mass of electron iv) None of the these.

3) Electron behaves as waves because they can be :
i) Deflected by an electric field ii) Diffracted by a crystal
iii) Deflected by magnetic field iv) They ionize a gas.

4) In Davison – Gelmer experiment the hump is most prominent when the electron is accelerated by
i) 34 volts ii) 54 volts iii) 60 volts iv) 80 volts. **(04 Marks)**

b. Define Phase velocity and Group velocity. Show that Group velocity is same as particle velocity. **(08 Marks)**

c. Derive de – broglie wave length using Group velocity. **(04 Marks)**

d. Compare the energy of a photon with that of a neutron when both are associated with wave length of $1A^0$ given that the mass of neutron is 1.678×10^{-27}kg. **(04 Marks)**

2 a. 1) The product of uncertainty between angular momentum and angular displacement is

i) $\geq \frac{h}{2\pi}$ ii) $\geq \frac{h}{4\pi}$ iii) $\frac{h}{2\pi}$ iv) $\leq \frac{h}{4\pi}$.

2) Kinetic energy of electron accelerated by a voltage 50Volts.
i) 50ev ii) 10ev iii) 5ev iv) 15ev.

3) The energy of the lowest state in one dimensional potential box of length is

i) Zero ii) $\frac{2h^2}{8ma^2}$ iii) $\frac{h^2}{8ma^2}$ iv) $\frac{h}{8ma^2}$

3 a. Choose the correct answer : (04 Marks)

(i) In diesel engine heat is supplied at constant
(A) Temperature (B) Pressure (C) Volume (D) Enthalpy

(ii) In two stroke engine, number of rotation of the crankshaft to complete a cycle
(A) 2 (B) 4 (C) 6 (D) 1

(iii) In CI engine, in suction stroke _____ is sucked in the cylinder.
(A) Air (B) Air-fuel-mixture (C) Fuel-air-mixture (D) Petrol.

(iv) In a SI engine, heat is supplied at
(A) Constant pressure (B) Constant temperature
(C) Constant spark (D) Constant volume.

b. Explain with neat sketch, working of four stroke petrol engine with P-V diagram. (08 Marks)

c. Following observations are taken during a trial on four stroke diesel engine. Cylinder diameter = 25cm, stroke = 40cm, Speed = 250 rpm, Break load = 70 kg, Break drum diameter = 2 mts, Mean effective pressure = 6 bar, diesel oil consumption = 0.1 m^3/min, specific gravity of fuel = 0.78, CV of fuel = 43900 kJ/kgK. Determine (i) IP (ii) BP (iii) FP (iv) Mechanical efficiency (v) Break thermal efficiency (vi) Indicated thermal efficiency. (08 Marks)

4 a. Choose the correct answer : (04 Marks)

(i) Monocloro – diafloro methane is popular refrigerant called
(A) NH_3 (B) Freon (C) Water (D) Carbon

(ii) One ton of Refrigeration is equal to _____ kJ/sec.
(A) 50 (B) 1.055 (C) 3.5 (D) 210

(iii) A reverse Carnot cycle is called
(A) Refrigeration cycle (B) Mechanical cycle
(C) Vapour compression cycle (D) Vapour absorption cycle

(iv) The efficiency of Refrigeration system is expressed by a factor known as
(A) mechanical efficiency (B) Co-efficient of performance
(C) Thermal efficiency (D) Performance ratio.

b. Explain with neat sketch, working of vapour absorption refrigeration system. (08 Marks)

c. Explain in brief properties of good refrigerant. (08 Marks)

PART – B

5 a. Choose the correct answer : (04 Marks)

(i) ..... is the process of generating internal threads.
(A) Tapping (B) Turning (C) Knurling (D) None.

(ii) .....finishing operation to produce a flat round surface around already drilled hole
(A) Counter sinking (B) Counter boring (C) Spot facing (D) Tapping

(iii) ..... is the operation of removing excess material from the surface of the cylindrical workpiece.
(A) Taper turning (B) Plain turning (C) Boring (D) Facing

(iv) ..... is the operation of embossing a diamond shaped pattern on the surface of workpiece.
(A) Taper turning (B) Knurling (C) Threading (D) Eccentric turning

b. Draw the neat sketch of center lathe and indicate the parts. (08 Marks)

c. With neat sketch explain the mechanism of Taper turning by swiveling compound rest. (04 Marks)

d. With neat sketch explain Radial drilling machine. (04 Marks)

2) n_1 be the number density of lower energy E_1 and n_2 be the number density of higher energy E_2, if $n_2 > n_1$ is called
   i) Thick population ii) Inverted population
   iii) Normal population iv) No population.
3) Supply of energy to atoms for excitation is called
   i) Glowing ii) Bombarding iii) incidenting iv) Pumping.
4) Important characteristic of Laser beam is
   i) Interference ii) Diffraction iii) Dispersion iv) Coherence. **(04 Marks)**

b. Obtain an expression for energy density of radiation under equilibrium condition in terms of Einstein co-efficient. **(08 Marks)**

c. Describe the construction and working of Semiconductor laser. **(08 Marks)**

6 a. 1) The temperature at which super conductivity occurs is called :
   i) Low temperature ii) Super temperature
   iii) Critical temperature iv) High temperature.
2) Super conductivity phenomenon can be explained on the basis of :
   i) BCS theory ii) CCS theory iii) DCS theory iv) MCS theory
3) Meissner effect will take place in
   i) Solid ii) Super conducting magnet iii) Magler vehicle iv) MRI.
4) Loss of power during transmission through optical fiber is called.
   i) Power loss ii) Energy loss iii) Attenuation iv) Modification. **(04 Marks)**

b. Explain Meissner effect. **(06 Marks)**

c. Obtain an expression for numerical aperture and arrive the condition for propagation. **(06 Marks)**

d. The angle of acceptance of an optical fiber is 30^0 when kept in air. Find the angle of acceptance when it is in a medium of refractive index 1.33. **(04 Marks)**

7 a. 1) The coordination number in the case of simple cubic crystal structure is
   i) 12 ii) 6 iii) 2 iv) 1.
2) Which of the following metal crystallizes in fcc structure
   i) Aluminium ii) Zinc iii) Sodium iv) Calcium chloride
3) The number of molecules present in unit cell of sodium chloride is
   i) 5 ii) 2 iii) 4 iv) None of these.
4) The Miller indices of the plane parallel to x and y axis are
   i) (100) ii) (010) iii) (001) iv) (111) **(04 Marks)**

b. How do you find miller indices of a given plane. **(04 Marks)**

c. Derive an expression for interplaner spacing in terms of miller indices. **(08 Marks)**

d. Calculate the glancing angle for incidence of X rays of wave length 0.58Å^0 on the plane (132) of NaCl which results in second order diffraction maxima taking the lattice as 3.81Å^0. **(04 Marks)**

8 a. 1) A constant testing of product without causing any damage is called **(04 Marks)**
   i) Minute testing ii) Destructive testing
   iii) Non destructive testing iv) Random testing.
2) The state of matter around the nano size is known as
   i) Solid state ii) Liquid state iii) Plasma state iv) Meroscopic state
3) If the reduction is in two direction the resultant structure will be in one dimension which is called
   i) Reduced structure ii) Thin wire iii) Quantum wire iv) Enlarge structure.
4) The signal due to a reflected wave is called
   i) Transmitted wave ii) Longitudinal wave iii) Echo iv) Peaco.

b. Describe a method of measuring velocity of ultrasonic waves in solids. **(08 Marks)**

c. Explain nano tubes and its applications. **(08 Marks)**