(B) What is an oscillator ? Explain the Barkhausen criterion for sustained oscillation. 3

(C) Draw the circuit diagram of phase shift oscillator, and explain its working. 5

OR

13. (P) What is multivibrator ? Draw the circuit diagram of a stable multivibrator and explain its working. 5

(Q) Discuss the effect of negative feedback on distortion in amplifier. 4

(R) Determine the frequency of oscillation of Colpitts oscillator, if $C_1 = 100\,Pf$, $C_2 = 1000\,Pf$ and $L = 5\,\mu H$. 3

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Fifth Semester B. Sc. (Part – III) Examination

5S – PHYSICS

P. Pages : 8

Time : Three Hours] [Max. Marks : 80

Note : (1) All questions are compulsory.
(2) Draw suitable and neat diagram wherever necessary.

1. (A) Fill in the blanks :—

(i) GM counter should be operated in —.

(ii) The magnitude of orbital angular momentum according to vector atom model is ——.

(iii) The energy level with more than one eigen function is called as —— energy level.

(iv) The input impedance of amplifier —— with negative feedback. 2

(B) Choose the correct alternative :—

(i) Orbital quantum number determines the shape of —.

(a) Nucleus (b) Atom

(c) Electron orbit (d) None of these.

(ii) In characteristic x–ray spectra k_β line is produced due transition of electron from ——

(a) K shell to L shell

(b) K shell to M shell

(c) L shell to K shell

(d) M shell to K shell.

(iii) Negative feedback in amplifier ——

(a) Reduces voltage gain

(b) Reduces output impedance.

(c) Reduces noise.

(d) All of above.

(iv) x–rays are ——

(a) Charged particles.

(b) Electromagnetic radiations of long wave length.

(c) Stream of neutrons.

(d) Electromagnetic radiations of short wave length. 2

(C) Answer in **one** sentence.

(i) What is Compton effect ?

(ii) What is α–decay ?

EITHER

10. (A) Define :—

(i) Stability factor.

(ii) Signal to noise ratio. 2

(B) Draw the circuit diagram of two stage RC coupled amplifier. Derive an expression for voltage gain in mid frequency region. 5

(C) What is Miller effect ? Explain. 2

(D) Discuss the gain frequency response of RC coupled amplifier. 3

OR

11. (P) Explain class A, Class B, and class C amplifier. 6

(Q) What are hybrid parameters ? 1

(R) What is distortion ? Explain phase distortion in amplifier. 3

(S) Draw hybrid equivalent circuit for CE amplifier. 2

EITHER

12. (A) State advantage and disadvantages of negative feedback. 4

EITHER

8. (A) What is range of α–particle. State and explain Geiger–Nuttal law. 4

(B) Define :—

(i) Mass defect.

(ii) Binding energy. 3

(C) Explain the nuclear fission with example. 3

(D) What is chain reaction ? State its types. 2

OR

9. (P) Describe nuclear fusion as a source of steller energy. 2

(Q) Discuss Gamow's theory of α–decay. 5

(R) What is quenching in GM counter ? Explain. 3

(S) Define :—

(i) Dead time.

(ii) Recovery time. 2

(iii) What is noise ?

(iv) What is degree of degeneracy ? 4

EITHER

2. (A) Derive Einstein's photoelectric equations. 3

(B) What is De–Broglie Hypothesis ? Show that the wavelength 'λ' associated with an electron of mass 'm' and energy 'E' is given by

$$\lambda = \frac{h}{(2mE)^{1/2}}$$ 4

(C) State and explain Planck's law of radiation. 3

(D) If the work function of certain metal is 3eV. What is its threshold wavelength. ($h = 6.63 \times 10^{-34}$ J.sec and $C = 3 \times 10^{8}$ m/sec) 2

OR

3. (P) Define :—

(i) Photoelectric work function.

(ii) Threshold wavelength.

(iii) Stopping potential. 3

(Q) Show that group velocity is equal to particle velocity. 3

(R) State and explain Heisenberg's uncertainty principle for position and momentum. 3

(S) Calculate De–Broglie wavelength of electron which has a maximum kinetic.energy equal to 25eV. (mass of electron is 9.1×10^{-31} Kg) 3

EITHER

4. (A) Define operators in quantum mechanics, and find quantum mechanical operator for kinetic energy. 3

(B) Derive Schrodinger's time dependent equation for matter waves. 4

(C) What is normalized wavefunction ? Explain. 2

(D) Explain the term :—

(i) Eigen value and

(ii) Eigen function. 3

OR

5. (P) Show that minimum energy of a particle confined in rigid cubical box of length 'l' is $E = \frac{3\hbar^2\pi^2}{2ml^2}$, Where, m is mass of particle. 6

(Q) Give the physical significance of wave function ψ. 5

(R) What are degenerate and nondegenerate energy levels. 2

EITHER

6. (A) State and explain Duane and Hunt's law. 4

(B) What is Raman effect ? Describe an experimental arrangement to study Raman effect. State the applications of Raman effect. 6

(C) An x–ray tube operates with accelerating voltage of 30Kv. Calculate the minimum wavelength of x–rays emitted. 2

OR

7. (P) Explain the concept of space quantization and electron spin in vector atom model. 4

(Q) What are stokes and antistokes line in Raman spectrum ? Give Quantum theory of Raman effect. 5

(R) What are selection rules ? State the selection rules for the spectral lines. 3