Department of Physics

B.Sc General Model Questions

Course Title- Analog System and Applications

Semester – III

1. Sketch the variation of space charge, electric field and potential as a function of distance across the junction of an open circuited p-n junction.
2. Explain the origin of the intrinsic potential barrier across a p-n junction.
3. Draw a schematic diagram of the energy band structure of a forward biased p-n junction.
4. How are the width of the space-charge region and the barrier height affected when a p-n junction is (i) forward-biased (ii) reverse-biased?
5. Define conductivity and mobility.
6. What do you mean by drift velocity?
7. Define the static resistance and dynamic resistance of p-n junction diode. Are they equal? If not, why? Do these resistances depend on temperature and bias voltages?
8. What is the origin of the reverse saturation current in a p-n junction? Does the reverse saturation current change with the applied reverse biase and the diode temperature? Explain
9. Derive the barrier potential, barrier width and current for step junction.
10. What is breakdown diode? Discuss the origin of breakdown of a junction.
11. Draw the circuit diagram of (i) a half-wave rectifier and (ii) a full-wave rectifier. Explain the principle of operation of each circuit.

12. Explain the operation of a bridge rectifier with the help of a circuit diagram.
13. Calculate the ripple factor and rectification efficiency of a half-wave and a full-wave rectifier.
14. What is the difference between avalanche breakdown and Zener breakdown of a p-n junction?
15. Explain the voltage regulator circuit using Zener diode.
16. Explain the principle operation of (i) LEDs (ii) Photodiode and (iii) Solar cell.
17. Why is silicon not preferred as an LED material?
18. Illustrate the difference modes of operation by drawing the circuit diagrams for (i) an n-p-n transistor and (ii) a p-n-p transistor.
19. What do you mean by static characteristics of a transistor? Draw the circuit diagram of (i) common-base(CB), (ii) common-emitter and (iii) common-collector configuration and sketch their output characteristics. Indicate the active, cutoff, and saturation regions.
20. Explain the current amplification factors α and β for CE and CB configurations, respectively, of a p-n-p transistors. Obtain a relation between them.
21. What do you mean by DC load line.
22. Define Q-point.
23. What are the factors that affect the bias stability of a transistor?
24. Discuss the effect of the biasing resistors on the voltage gain, the input resistance and the output resistance for (i) fixed bias, and (ii) voltage-divider bias of a BJT.
25. How is a transistor represented as a two-port device?

26. Define the hybrid parameter for a basic transistor circuit in any configuration and give its hybrid model.
27. What are the advantages of the h-parameters?
28. Draw the low-frequency h-equivalent circuit of a CE mode transistor and obtain expressions for current gain, input resistance, voltage gain and output admittance.
29. What are the fundamental differences between a class A and a class C amplifier?
30. Draw the circuit diagram of a two-stage RC-coupled CE transistor amplifier. Show how the magnitude and the phase angle of its voltage gain vary with frequency.
31. Show that, in the presence of negative feedback, the phase distortion in an amplifier is reduced.
32. Show that negative feedback improves the stability of the gain of an amplifier.
33. What is the Barkhausen criterion? State the basic conditions for oscillation in a feedback amplifier. What are the primary requirements to obtain steady oscillations at a fixed frequency?
34. What is the difference between Colpitts and Hartley oscillator?
35. Derive the condition for sustained oscillations and the frequency of oscillation in a Colpitts oscillator.
36. State the characteristics of an ideal and a Practical Op-Amp.
37. What do you mean by Open-loop and Closed-loop gain of an Op-Amp?
38. Define CMRR and Slew rate of an Op-Amp.

39. Show with a circuit diagram the use of an Op-Amp in a non-inverting amplifier. Obtain the expression for the voltage gain.
40. Describe the use of an Op-Amp as an adder.
41. Draw the circuit diagram of an Integrator using an Op-Amp and find the expression for the output voltage.
42. Draw the circuit diagram of a Wien-bridge oscillator with an Op-Amp as an active element.
43. What do you mean by D/A and A/D converters? What are their uses?
44. Draw a circuit diagram of a D/A converter using R – 2R ladder and write down the output expression.

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