BE Semester-III EC Question Bank

Electronic Devices & Circuits I

All questions carry equal marks (10 marks)

Q.1	Sketch the curves (as a function of distance across the junction) of : (i) charge density, (ii) electric field, (iii) potential for the (a) open circuited p-n junction and (b) reversed biased p-n step graded junction.
Q.2	Describe the Hall effect. Derive equation of hall voltage V_H and mobility.
Q.3	Answer the following. (a) Explain zener breakdown. (b) What is offset voltage and breakdown voltage for a semiconductor diode? (c) Explain donor and acceptor impurities.
Q.4	Sketch the circuit of a half-wave rectifier and explain its operation. Derive V_{dc}, V_{rms} & PIV for it.
Q.5	Derive equation for mobility and conductivity for metal.
Q.6	Define a graded and step graded semiconductor. Explain why an electric field must exist in a graded semiconductor. Verify the Boltzman relationship of kinetic gas theory for the graded semiconductor.
Q.7	For the full wave circuit derive the expressions for dc current, dc output voltage, rms current, rectifier efficiency and ripple factor.
Q.8	Explain the operation of a p-n junction diode in forward biased and reverse biased condition. Draw its V-I characteristics.
Q.9	With the help of a piecewise linear transmission characteristic of a diode circuit, explain one sided clipper.
Q.10	Derive expression of space charge capacitance C_T for a step graded junction.
Q.11	Sketch the family of CE input and output characteristics for a transistor. Explain the shapes of the curves qualitatively. Write equations which describe the family of input and output characteristics curves.
Q.12	Explain various current components in PNP transistor.
Q.13	Draw CB configuration of transistor. Sketch and explain family of CB input and output characteristics for npn transistor.
Q.14	(1) Among the three configurations CC, CB, CE, which of the configuration has the (a) highest R_i (b) lowest R_i (c) highest R_o (d) lowest R_o (e) lowest A_V (f) lowest A_I. (2) What is Base width Modulation?
Q.15	Discuss thermal runaway. Define thermal resistance. What is the condition for thermal stability?
Q.16	Draw and explain self bias circuit. Mention its advantages over fixed bias circuit.
Q.17	Derive the equation for the stabilization factor S and the stability factor S'.
Q.18	Explain DC load line and Q point for any transistor configuration. Also state the necessity of biasing and list biasing methods for transistor.
Q.19	Draw and explain energy band diagram of insulator, semiconductor and metal. Why silicon is always preferred than germanium?
Q.20	For the transistor amplifier stage, derive the expression for the following in terms of its h parameters: (i) current gain (iii) input impedance (ii) Voltage gain (iv) voltage gain including source resistance.
Q.21	Draw hybrid small signal model for a transistor in CE configuration. Define in words and also as a partial derivative (a) h_{ie} (b) h_{fe} (c) h_{re} (d) h_{oe}.
Q.22	Determine h-parameter for the two port network. Also draw the hybrid model for CE, CB,

	and CC configuration.
Q.23	Draw the basic structure of N- channel enhancement MOSFET. Also draw & explain the drain and transfer characteristics.
Q.24	Describe working of n-channel JFET with help of constructional diagram and draw its drain characteristic.
Q.25	Explain common source drain characteristics & transfer curve for n-channel FET.
Q.26	Define three FET parameter g_m, r_d and μ. Prove that $\mu = g_m \times r_d$.
Q.27	(a) Compare BJT and FET. (b) Compare FET and MOSFET.
Q.28	List the basic configuration of a low frequency FET amplifier. Explain any one of them with the help of neat circuit diagram and small signal equivalent circuit.
Q.29	Classify amplifiers based on position of the quiescent point. Discuss different types of distortion in amplifier.
Q.30	Discuss step response of an amplifier. Define: (a) rise time (b) tilt What is relationship between t_r and the high 3-dB frequency f_H? How is the tilt related to the low 3-dB frequency f_L?
Q.31	Derive the expression for the high 3-dB frequency f_H^* of n identical non interacting stages in terms of f_H for one stage. Derive the expression for the low 3-dB frequency f_L^* of n identical non interacting stages in terms of f_L for one stage.
Q.32	Describe the effect of bypass capacitor and coupling capacitor in multistage common emitter amplifier.
Q.33	Write short note on C, LC and π Filter.
Q.34	Draw hybrid π model for a transistor in CE configuration. Derive the formula for transistor transconductance g_m.

Q.35	The upper 3dB frequency of 16kHz and lower 3db frequency of 25kHz of a three identical stage cascaded amplifier. Calculate:
	     (1) f_L and f_H of each stage
	     (2) bandwidth of each stage.

Q.36	Write short note on Validity of Hybrid π model.
Q.37	Write short notes on Bias compensation techniques (Using diode, thermistor and sensistor)
Q.38	Write short notes on (a)Classification of FET (with symbols) (b)FET as a Voltage variable resistor
Q.39	Write short notes on Phototransistor and Photodiode
Q.40	Explain the working of RC Coupled amplifier with neat diagram. Also obtain its frequency response.