Reg. No.															

Question Paper Code	13696

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Second Semester

Electronics and Communication Engineering

(Common to Electrical and Electronics and Engineering & Computer and Communication Engineering)

20BSPH201 – PHYSICS OF ELECTRONIC DEVICES

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	The constant in Wiedemann–Franz law is called as: (a) Avogadro constant (b) Planck constant (c) Lorenz number (d) Boltzmann number	1	K1	CO1
2.	For free electrons in a three-dimensional metal, the density of states is proportional to (a) E^0 (constant) (b) $E^{1/2}$ (c) E (d) $E^{3/2}$	1	K2	CO1
3.	Which of the following dopants is usually used to construct an n-type extrinsic semiconductor? (a) Boron (b) Phosphorus (c) Gallium (d) Indium	1	K1	CO2
4.	The physical process that is accountable for the coherent light emission in a laser diode? (a) Spontaneous emission (b) Thermal radiation (c) Stimulated emission (d) Impact ionization	1	K1	CO2
5.	The temperature above which ferromagnetic materials lose their magnetism is named: (a) Curie temperature (b) Critical temperature (c) Boiling point (d) Magnetic saturation temperature	1	K2	CO3
6.	Clausius-Mossotti equation is valid for: (a) Highly conducting materials (b) Dense ionic solids only (c) Homogeneous, isotropic, non-polar materials (d) Anisotropic magnetic materials	1	K2	CO3
7.	The relationship among emitter, base, and collector currents is: $I_B = I_C - I_B$ (b) $I_C = I_E - I_B$ (c) $I_C = I_E - I_B$ (d) $I_E = I_B + I_C$	1	K1	CO4
8.	The Hybrid-π model is predominantly used for: (a) Small-signal analysis of BJTs (b) Large signal analysis of MOSFETs (c) DC bias analysis of FETs (d) Power amplifier design	1	K1	CO4
9.	Compared to a JFET, a MOSFET has: (a) Lower input impedance (b) Higher power dissipation (c) Higher input impedance (d) Higher noise figure	1	K2	CO5
10.	A Light Emitting Diode (LED) emits light when: (a) Reverse biased (b) Forward biased (c) No voltage is applied (d) AC is applied	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Define Fermi energy level. Give its significance.	2	K1	CO1
12.	State Electron effective mass.	2	K1	CO1
13.	Give two examples of an intrinsic semiconductor.	2	K1	CO2
14.	Draw the V-I characteristics of a PN junction diode in both forward and reverse bias.	2	K2	CO2
15.	Distinguish between Zener and avalanche breakdown.	2	K2	CO2
16.	On a microscopic level, how are magnetic materials classified?	2	K2	CO3

17.	Define saturation magnetization.	*2*	*K1*	*CO3*
18.	List the different types of polarization in dielectric materials.	*2*	*K1*	*CO3*
19.	Sketch the symbol of NPN and PNP transistor.	*2*	*K2*	*CO4*
20.	Mention the application where a multi-emitter transistor is normally used.	*2*	*K1*	*CO4*
21.	Define the threshold voltage of a MOSFET.	*2*	*K1*	*CO5*
22.	How does a CCD convert light into electronic signals?	*2*	*K1*	*CO5*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Obtain an expression for thermal conductivity in metals using classical theory.	*11*	*K2*	*CO1*
		OR			
	b)	Derive the expression for the effective mass of an electron in a solid and explain its significance.	*11*	*K2*	*CO1*
24.	a)	Deliberate the process of doping and how it alters the carrier concentration in semiconductors.	*11*	*K3*	*CO2*
		OR			
	b)	Explain the working of a Zener diode and its characteristic breakdown behavior.	*11*	*K3*	*CO2*
25.	a)	Describe domain theory in ferromagnetic materials.	*11*	*K2*	*CO3*
		OR			
	b)	Explain the dielectric loss and derive an expression for it.	*11*	*K2*	*CO3*
26.	a)	Explain the construction and working of a NPN transistor in CB configurations and discuss the input and output characteristics.	*11*	*K3*	*CO4*
		OR			
	b)	Clarify how the Hybrid-π model simplifies the analysis of BJTs for amplifier design.	*11*	*K3*	*CO4*
27.	a)	Elucidate the construction, working, and characteristics of D-MOSFET with a neat sketch.	*11*	*K2*	*CO5*
		OR			
	b)	Illuminate the construction and working of a solar cell. Mention its merit and demerit.	*11*	*K2*	*CO5*
28.	a)	Explain with a neat sketch the construction, working and characteristics of N-channel JFET.	*11*	*K2*	*CO6*
		OR			
	b)	Explain the construction, working operation and characteristics of UJT with a neat sketch.	*11*	*K2*	*CO6*