

End Semester Examination May-June. 2025

Name of the course: B. Tech

Semester: II

Name of the Paper: Basic Electronics Engineering

Paper Code: **TEC 201**

Time: 3 Hours

Maximum Marks: 100

Note:

- (i) All questions are compulsory
- (ii) Answer any two **questions** among a, b, & c **in each main question**.
- (iii) Total marks in each main question are twenty
- (iv) Each question carries 10 marks

Q1	(20 marks)	
(a)	Minimize the following expression by K-map and realize the minimized function by (i) NAND gate only (ii) NOR gate only $F(A, B, C, D) = \pi M(0, 1, 3, 5, 7, 8, 9, 11, 13, 14, 15)$	CO1
(b)	Discuss the different laws of Boolean Algebra. Explain the min-terms and max-terms form of a Boolean Expression.	
(c)	(i) $(C8B63.0B)_{16} = (?)_{10}$ (ii) $\sqrt{(41)_x} = (5)_x$, find the base "x". (iii) $(3415)_6 = (?)_{10}$ (iv) $(674763.67)_8 = (?)_{16}$	
Q2	(20 marks)	
(a)	Discuss mobility and conductivity of a Semiconductor. Find the expression of conductivity for n-type and p-type semiconductors, respectively.	CO2
(b)	A sample of Ge is made p-type by adding acceptor atoms at a rate of one atom per $5 \times 10^8/\text{m}^3$. If density of Ge atoms is $2.4 \times 10^{25}/\text{m}^3$, determine electron and hole concentration in the doped semiconductor, $n_i = 2.5 \times 10^{15}/\text{m}^3$.	
(c)	What is a diode? Explain the forward and reverse bias conditions of a PN junction diode with its V-I characteristics.	
Q3	(20 marks)	
(a)	A crystal diode having internal resistance of 25Ω is used for half wave rectification. If a 240 V, 50Hz is applied to the primary winding of the transformer, used in the rectifier, with turns ratio of 10:1 and load resistance is $1\text{ k}\Omega$, then find: (i) I_m, I_{dc}, I_{rms} (ii) ac power input (iii) dc power output (iv) dc output voltage (v) Ripple factor (γ)	CO3
(b)	Discuss the significance of the ripple factor in a rectifier. Derive an expression for the ripple factor (γ) for a full-wave bridge rectifier.	
(c)	Explain the working of a half-wave rectifier with a capacitor filter and draw an appropriate circuit diagram as well as input/output waveforms. Also, derive the RMS current for a half-wave rectifier without a filter.	

Q4	(20 marks)	CO2/CO3
(a)	What is a Bipolar Junction Transistor? Explain the working of the NPN transistor in the CB configuration.	
(b)	With the appropriate circuit diagram, discuss the input and output characteristics of the Common Emitter Configuration of a BJT.	
(c)	(i) Derive the relationship between I_{CEO} and I_{CBO} . (ii) Calculate α and β of a transistor for which I_C is 5 mA, I_B is 65 μ A and I_{CBO} is 1.7 μ A.	
Q5	(20 marks)	CO3/CO4
(a)	Explain inverting and non-inverting amplifier in detail.	
(b)	Derive an expression for output voltage of difference amplifier.	
(c)	Derive an expression for output voltage of summing amplifier.	