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Question Paper Code : 20926

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Third Semester

Electronics and Communication Engineering

EC 3353 — ELECTRONIC DEVICES AND CIRCUITS

(Common to Electronics and Telecommunication Engineering)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. A Ge diode has a saturation current of $10 \mu\text{A}$ at 300K. Find the saturation current at 400°K
2. A full-wave rectifier uses two diodes, the internal resistance of each diode may be assumed constant at 20Ω . The transformer R.M.S. secondary voltage from Centre tap to each end of secondary is 50 V and load resistance is 980Ω . Evaluate (a) The mean load current (b) The R.M.S. value of load current.
3. An amplifier operating from $\pm 3\text{V}$ provide a 2.2V peak sine wave across a 100 ohm load when provided with a 0.2V peak sine wave as an input from which 1.0 mA current is drawn. The average current in each supply is measured to be 20mA. What is the amplifier efficiency?
4. Define current amplification factor.
5. Write the hybrid parameters equation for transistor amplifier?
6. Which type of connection is made for cascode amplifier?
7. What is transition and diffusion capacitance?
8. State Barkhausen criterion for sustained oscillation. What will happen to the oscillation if the magnitude of the loop gain is greater than unity?

9. Determine the input impedance of a differential amplifier (emitter coupled) with $R_B = 3.9 \text{ k}\Omega$ and $Z_B = 2.4 \text{ k}\Omega$.
10. What is DC-DC bidirectional converter?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the V-I characteristics of PN junction diode. (7)
(ii) Explain the principle of operation of a full wave rectifier. (6)

Or

- (b) How is Zener diode used as voltage regulator? Explain the working principle Zener voltage regulator.
12. (a) Derive the equations for voltage gain, current gain, input impedance and output admittance for a BJT using low frequency h-parameter model for (i) CE configuration (ii) CB configuration and (iii) CC configuration.

Or

- (b) (i) Explain the operation of power transistor.
(ii) Describe two applications of BJT.
13. (a) An amplifier rated at 40W output is connected to a 10Ω speaker.
(i) Calculate the input power required for full power output if the power gain is 25 db. (7)
(ii) Calculate the input voltage for rated output if the amplifier voltage gain is 40 db. (6)

Or

- (b) What is differential amplifier and explain any one type in detail.
14. (a) Give a thorough explanation of all feedback amplifier classification.

Or

- (b) Explain pierce crystal oscillator and derive the equation for oscillation.
15. (a) In an amplifier, the output power is 1.5 watts at 2 kHz and 0.3 watt at 20 Hz, while the input power is constant at 10 mW. Calculate by how many decibels gain at 20 Hz is below that at 2 kHz.

Or

- (b) What is boost converter and buck converter? How does a buck-boost circuit work?

PART C — (1 × 15 = 15 marks)

16. (a) The four semiconductor diodes used in a bridge rectifier circuit have forward resistances which can be considered constant at 0.1Ω and infinite reverse resistances. They supply a mean current of 10 A to a resistive load from a sinusoidal varying alternating supply of 20 V RMS. Determine the resistance of the load and efficiency of the circuit.

Or

- (b) Draw and explain the operation of a Hartley oscillator derive the equation for F_r and H_{je} .