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Question Paper Code : 81231

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

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. Draw the V-I characteristics of a PN junction diode and label the regions.
2. State any two advantages of using a Zener diode for voltage regulation.
3. Which BJT configuration provides high voltage gain and phase shift of 180°?
4. Define bandwidth of an amplifier.
5. Mention any two advantages of using a cascade amplifier.
6. What is neutralization in RF amplifier design?
7. Define desensitivity in negative feedback amplifier.
8. Differentiate between series and shunt feedback.
9. What is the main function of a buck converter?
10. Mention two key features of power MOSFETs.

PART B — (5 × 13 = 65 marks)

11. (a) With a neat diagram, explain the construction, working, and V-I characteristics of a MOSFET. Distinguish between enhancement and depletion modes.

Or

- (b) Derive the expressions for average and RMS values of output voltage of Half Wave and Full Wave Rectifiers. Compare their efficiency and ripple factors.
12. (a) With neat diagrams, explain the high frequency model of a transistor. How does it affect amplifier performance?

Or

- (b) A BJT has $V_{CC} = 12\text{ V}$, $R_C = 2\text{ k}\Omega$, and $R_E = 1\text{ k}\Omega$. If $V_{CE} = 6\text{ V}$, find the collector current and verify the Q-point on the load line.
13. (a) Explain how a MOSFET differential input stage works in an operational amplifier. Also describe its benefits over BJT input stages.

Or

- (b) Draw and explain the working of a single tuned amplifier. And derive its voltage gain and frequency response.
14. (a) Describe the operation and frequency determination of the Wien Bridge Oscillator.

Or

- (b) A Colpitts oscillator uses $C_1 = 100\text{ pF}$, $C_2 = 200\text{ pF}$, and an inductance $L = 10\text{ }\mu\text{H}$.
- (i) Calculate the frequency of oscillation.
- (ii) Discuss how changing C_1 or C_2 affects the frequency.
15. (a) Explain the design and operation of a Class AB power amplifier using MOSFETs.

Or

- (b) Explain the operation and analysis of a boost converter. And discuss the switching behaviour and energy transfer mechanism.

PART C — ($1 \times 15 = 15$ marks)

16. (a) Design a two-stage cascode amplifier using MOSFETs with a total gain of at least 500. Justify your component choices and explain the effect on high-frequency response.

Or

- (b) Design a Class AB power amplifier using MOSFETs for an audio application with the following specifications:

Supply voltage: 24 V

Output power: 20 W into $8\ \Omega$ load

Minimize crossover distortion and ensure good efficiency.

Draw the circuit, explain the biasing method, and calculate the quiescent current needed to reduce distortion.

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