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Question Paper Code : 90982

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 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. Zener diode has a saturation current of 20A and reverses breakdown voltage of 100 V whereas the corresponding values are 40 microA and 40V. Find the current through the circuit.
2. Why Si and GaAs are preferred materials for solar cells?
3. Classify amplifiers based on the position of the quiescent point.
4. What is small signal analysis in MOSFET?
5. Define cascade amplifier.
6. If four identical amplifiers are cascaded each having $f_L = 100$ Hz, determine the Overall lower 3 dB frequency f_L . Assume non - non-interacting Stages.
7. State the differences between an Amplifier and an oscillator.
8. State Barkhausen criterion for oscillation.
9. In a tuned amplifier $L = 100$ microH and $C = 100$ pF. Determine its resonant frequency.
10. What is a stagger tuned amplifier?

PART B — (5 × 13 = 65 marks)

11. (a) With the help of a circuit diagram, explain the working of a p-n junction diode as a half-wave rectifier.

Or

- (b) Using the necessary circuit diagrams, show how the V -I characteristics of a p-n junction are obtained in

(i) Forward biasing (7)

(ii) Reverse biasing (6)

12. (a) (i) Discuss the working of a common collector amplifier and derive expressions for its voltage gain and input/output impedance. (6)
 (ii) Discuss Base width Modulation. (7)

Or

- (b) Determine the h-parameter for the two-port network. Also draw the hybrid model for CE, CB and CC configuration.
13. (a) With a neat diagram, explain the Cascade amplifier and derive the voltage gain, input resistance, current gain and output resistance of cascade amplifier.

Or

- (b) (i) Describe Darlington Connection. (6)
 (ii) With the diagram, derive the expression for the current gain and input resistance of the Darlington amplifier. (7)
14. (a) (i) Determine the input and output resistances of the Current Shunt feedback amplifier. (6)
 (ii) An amplifier has a voltage gain of 400, $f_1 = 50$ Hz, $f_2 = 200$ kHz, and a distortion of 10% without feedback. Determine the amplifier voltage gain, f_{1f} , f_{2f} and D_f when a negative feedback is applied with a feedback ratio of 0.01. (7)

Or

- (b) With the help of a neat circuit diagram, discuss the RC phase shift oscillator using BJT and also derive the expression for its frequency of oscillations.
15. (a) (i) With a neat diagram explain the Series fed, Directly coupled Class A Power Amplifier and derive its maximum efficiency. (7)
 (ii) A series-fed Class A amplifier shown in Fig 15 (a) (ii) operates from a DC source and an applied Sinusoidal input signal generates a peak base current of 9 mA. Calculate (1) Quiescent current I_{CQ} (2) Quiescent voltage V_{CEQ} (3) DC input power P_{DC} [Fig 15 (a) (ii): NPN transistor Q1 ($\beta = 40$) in common emitter; $R_B = 1.2$ kohm from $+V_{CC} = 18$ V to the base; $R_L = 16$ ohm from $+V_{CC}$ to the collector, output V_o at the collector; emitter grounded; AC source coupled to the base through capacitor C.] (2 + 2 + 2) (6)

Or

- (b) (i) Discuss a tuned Amplifier with a neat diagram and derive the expression for its bandwidth. (7)
 (ii) A Class B push-pull amplifier drives a load of 16 ohm, connected to the secondary of the ideal transformer. The V_{CC} is 25V. If the number of turns on primary is 200 and secondary is 50. Calculate maximum power output, DC power input and efficiency. (6)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Describe the working principle of the Colpitts oscillator and derive the expression for the frequency of oscillations. (10)
 (ii) In the Colpitts oscillator, $C_1 = 0.2$ microF and $C_2 = 0.02$ microF. If the frequency of oscillation is 10 kHz, find the value of the inductor. (5)

Or

- (b) (i) Explain the effect of cascading on the bandwidth of a multistage amplifier. (8)
- (ii) If the overall lower and higher cutoff frequencies of two identical amplifier cascades are 600 Hz and 18 kHz respectively, compute the values of individual cutoff frequencies of both the amplifier stages. (7)
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