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Question Paper Code : 30136

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Third Semester

Electrical and Electronics Engineering

EC 3301 – ELECTRON DEVICES AND CIRCUITS

(Regulations 2021)

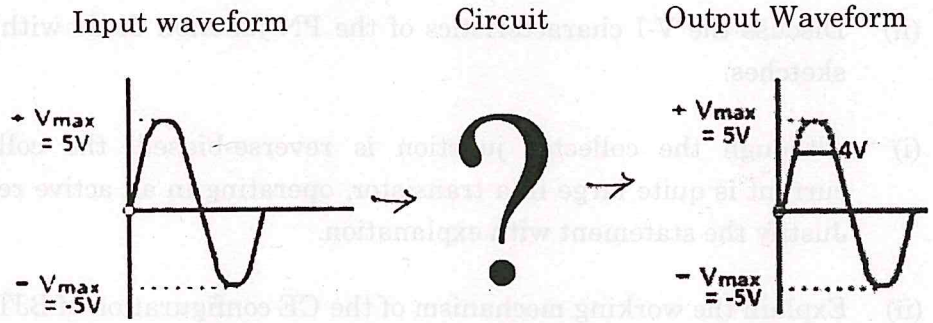
Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the necessity to use filters in conjunction with rectifiers.

2. Identify the diode circuit to get the following output waveform from the given input.



3. Recall the biasing arrangement for an NPN transistor to operate in the cut-off and saturation region.

4. Define intrinsic standoff ratio of UJT.

5. Recall the effects of coupling capacitors on the bandwidth of the amplifier

6. What is the significance of a small signal amplifier?

7. State Barkhausen criteria for amplifiers.

8. Compare voltage amplifier with power amplifier.

9. An amplifier has a gain of 300. When negative feedback is applied, the gain is reduced to 240. Find the feedback ratio.

10. In a Weinbridge oscillator, if the values of resistance, R=100KΩ and the frequency of oscillation is 10KHz, find the value of the capacitor, C.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Draw the circuit of a full wave rectifier using two diodes and explain the principle of working with relevant diagrams (7)

(ii) The turns ratio of a transformer used in a Bridge Rectifier is 12:1. The primary is connected to the power mains: 220V, 50Hz. Assuming the diode voltage drops to zero,

(1) Calculate the D.C voltage across the load resistor.

(2) What is the PIV of the diode?

(3) If the same dc voltage is obtained by using Center tapped FWR, what is PIV? (6)

Or

(b) (i) A Zener diode can be used as a voltage regulator. Justify with its operation. (6)

(ii) Discuss the V-I characteristics of the PN junction diode with neat sketches. (7)

12. (a) (i) Although the collector junction is reverse-biased, the collector current is quite large in a transistor, operating in an active region. Justify the statement with explanation. (6)

(ii) Explain the working mechanism of the CE configuration of BJT. (7)

Or

(b) (i) Explain the negative resistance characteristics of the uni junction transistor with neat sketches. (6)

(ii) Summarize the operation and characteristic behaviour of JFET under various biasing conditions. (7)

13. (a) (i) Using the low-frequency hybrid model, obtain the expressions for voltage gain, current gain, input impedance, and output impedance for CE configuration. (6)

(ii) The transistor in the amplifier circuit shown in Fig. 13(a)(ii) has h – parameters, hie=2kΩ and hfe = 80. The value of hoe and hre are negligible. Calculate the voltage gain and input impedance Z_i(amp) of the amplifier. Capacitors C_1, C_2, and C_3 may be assumed short at signal frequency due to small impedances. (7)

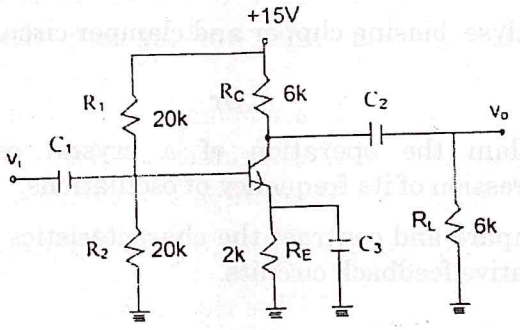


Fig. 13(a)(ii)

Or

(b) (i) Explain the high-frequency analysis of the CS amplifier. (7)

(ii) Compare CS, CD, and CG amplifiers. (6)

14. (a) (i) Analyze the effect of connecting a CB transistor to the CE amplifier on its input impedance and frequency response. (6)

(ii) Draw the block diagram of a 'n' stage cascaded amplifier and the expression for overall voltage gain. Also, determine the expression for bandwidth of a 'n' stage cascaded amplifier. (7)

Or

(b) (i) What is a differential amplifier? Explain its working. (6)

(ii) Summarize the importance of a single-tuned amplifier and explain is actual response. (7)

15. (a) (i) Draw the circuit of the Hartley oscillator and explain its working. Derive the expressions for frequency of oscillation and condition for starting of oscillation. (7)

(ii) With the necessary circuit diagram, explain the operation of a wein Bridge oscillator circuit. (6)

Or

(b) (i) Calculate the voltage gain, input, and output impedance of a voltage series feedback amplifier with A=500 $\beta = 0.01, R_i = 3K\Omega, R_0 = 20K\Omega$, and h_{fe}=–0.5 impedance. (6)

(ii) With appropriate derivations, discuss the effects of negative feedback on gain, bandwidth, input, and output impedances. (7)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Elucidate the mechanism of avalanche and Zener breakdown. (7)

(ii) Analyse biasing clipper and clamper circuits with neat sketches. (8)

Or

(b) (i) Explain the operation of a crystal oscillator and derive its expression of its frequency of oscillations. (8)

(ii) Compare and contrast the characteristics of positive feedback with negative feedback circuits. (7)

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