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Question Paper Code : 40437

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Third Semester

Biomedical Engineering

EC 8353 – ELECTRON DEVICES AND CIRCUITS

(Common to Computer and Communication Engineering/
Electrical and Electronics Engineering/
Electronics and Instrumentation Engineering/
Instrumentation and Control Engineering/Robotics and Automation)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define transition capacitance.

2. Draw the characteristics curve for LED.

3. What are the requirements for biasing circuits?

4. What is meant by negative resistance region of UJT?

5. Draw the small signal equivalent circuit of CE amplifier.

6. Why NPN transistor has a better high frequency response than the PNP transistor?

7. Mention the need for a coupling capacitor in amplifier circuits.

8. What is meant by neutralization?

9. Write the expression for input and output resistances of voltage series feedback amplifier.

10. Draw the equivalent circuit of crystal oscillator.

PART B — (5 × 13 = 65 marks)

11. (a) With neat sketches, explain the construction and L/I characteristics of Laser diode. Mention its applications. (13)

Or

(b) Determine the forward voltage and forward current for the PN junction diode shown in Figure 11 (b) for both ideal model (by taking $V_F = 0V$) and for practical model (by taking $V_F = 0.7V$). Also determine the voltage across the limiting resistor in each case. Assume $r'_d = 10\,\Omega$ at the determined value of forward current.

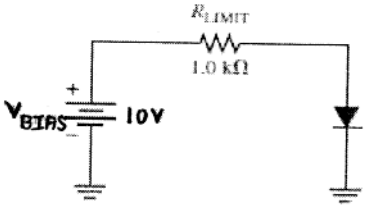

Figure 11 (b) (13)

12. (a) With neat sketches, explain the construction, working and characteristics of a n-channel D- MOSFET. (13)

Or

(b) With neat sketches, discuss about the construction, working and characteristics of IGBT. (13)

13. (a) Draw the small signal equivalent circuit of Common Source Amplifier operated at high frequency and explain. Derive the expression for the voltage gain of the CS amplifier. (13)

Or

(b) Draw the small signal equivalent model for Common collector amplifier constructed using BJT and derive the expression for current gain, voltage gain, input resistance and output resistance. (13)

14. (a) With neat circuit diagram and relevant equations, explain the working of a differential amplifier. Also derive the expression for single ended AC voltage gain of the circuit. (13)

Or

(b) With neat diagrams, elucidate the construction, operation and frequency response characteristics of a single tuned amplifier. Also mention why potential instability occur in tuned amplifiers? (13)

15. (a) Draw the circuit of a Colpitt's oscillator, explain its working and also derive the condition for the frequency of oscillation. (13)

Or

(b) Design a phase shift oscillator using FET having $g_m = 5000\,\mu S$, $r_d = 40K\Omega$ and feedback circuit value of $R = 10K\Omega$. Determine the value of C, R_L and R_D to have the frequency of operation as 1KHz and A>29. (13)

PART C — ($1 \times 15 = 15$ marks)

16. (a) A full wave rectifier is fed from a transformer having a center tapped secondary winding. The RMS voltage from either end of secondary to center tap is 30V. If the diode forward resistance is 2Ω and that of the half secondary is 8Ω, for a load of $1K\Omega$, determine the power delivered to load, percentage regulation at full load, rectification efficiency and transformer utility factor (TUF) of secondary. (15)

Or

(b) For the common-base amplifier shown in Figure 16 (b)

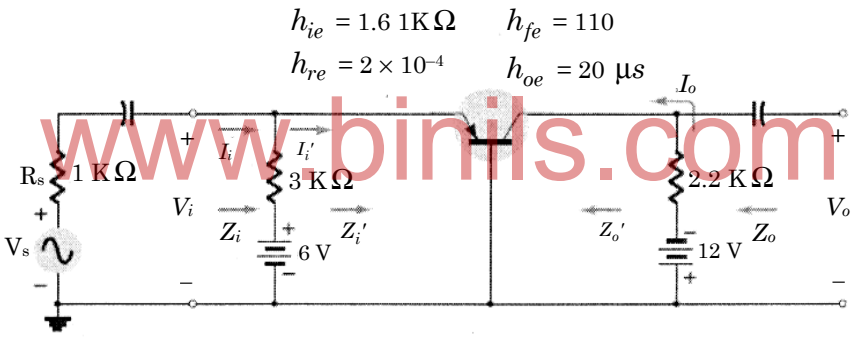

Figure 16 (b)

Draw the small-signal equivalent and using those parameters determine the input impedance (Z_i), Current Gain (A_i), Voltage Gain (A_v) as well as output impedance (Z_o). (15)

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