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**Question Paper Code : 80113**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

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 Engineering)

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Determine the peak output voltage of a half wave rectifier, if the diode has $V_F = 0.7V$ and the ac input is 22 V.

2. List few applications of lacer diode.

3. FET has lower thermal noise than BJT — Justify.

4. What is meant by latching in SCR?

5. An NPN common emitter amplifier circuit has the following parameters. $h_{fe} = 50$, $h_{ie} = 1k\,\Omega$ and $R_C = 3.3k\,\Omega$. Find the voltage gain of the amplifier.

6. State the need for coupling capacitor in a transistor amplifier.

7. Determine the input impedance of a differential amplifier (emitter coupled) with $R_B = 3.9k\,\Omega$ and $Z_B = 2.4k\,\Omega$.

8. A single tuned amplifier provides a bandwidth of 10kHz at a frequency of 1MHz. Find the circuit Q.

9. What is the condition required for satisfactory operation of a negative feedback amplifier?

10. An oscillator operating at 1 MHz has a stability of 1 in $10^4$. What will be the minimum value of frequency generated?

PART B — (5 × 13 = 65 marks)

11. (a) Outline the charge carrier diffusion phenomenon across a PN junction. Explain the effect of forward and reverse biasing on the depletion region. (13)

Or

(b) Explain the principle and operation of Light Emitting Diode (LED) with necessary expressions for current densities and efficiency of light generation. (13)

12. (a) (i) Brief about the operation of an N channel depletion type MOSFET with a neat diagram. (5)

(ii) Enumerate the characteristics of N channel depletion MOSFET with suitable graphs. (8)

Or

(b) Outline the structure of a SCR and explain its operation. Also illustrate its V- I characteristics. (13)

13. (a) (i) Draw the circuit of a CE amplifier with DC sources eliminated and deduce the small signal model for amplifier operation. (8)

(ii) Illustrate the steps involved in analyzing a BJT amplifier circuit using small signal model. (5)

Or

(b) (i) Explain the high frequency MOSFET model under CS configuration and its simplified equivalent circuit. (5)

(ii) Derive an expression for MOSFET unity gain frequency ($f_T$) (8)

14. (a) (i) With a neat circuit, outline the operation of a basic BJT differential pair configuration, under common mode input signal. (8)

(ii) Deduce expressions for Emitter currents in a differential amplifier under large signal operation. (5)

Or

(b) Illustrate the behavior of a MOSFET based amplifier circuit with tuned load. Also deduce expressions for voltage gain at centre frequency, Q and bandwidth. (13)

15. (a) With proper mathematical derivations, Prove that bandwidth increases and output resistance reduces in a negative feedback amplifier. Assume a series shunt feedback scheme. (13)

Or

(b) Outline the principle of LC tuned oscillators. With a neat circuit diagram deduce the necessary condition for oscillation and expression for oscillation frequency in the case of Colpitt's oscillator. (13)



PART C — (1 × 15 = 15 marks)

16. (a) An electronic load requires a constant 6.8 V DC for operation. However the supply voltage available is 10 V±1V. The load resistance is 2 KΩ. Design a simple shunt circuit with appropriate components to maintain the load voltage of 6.8V. Choose a proper device and justify your choice, by indicating its characteristics The circuit diagram for the entire operation should also be provided. (15)

Or

(b) Provide a circuit that can amplify AM Radio signals at 800 KHz. The signals occupy a bandwidth of 10 kHz and should be provided a gain of 100. Justify the choice of the circuit and explain the operation of the circuit. (15)

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