Question Paper Code : 20406

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Second/Third Semester

Electrical and Electronics Engineering

EC 6202 — ELECTRONIC DEVICES AND CIRCUITS

(Common to Biomedical Engineering / Electronics and Instrumentation Engineering/ Instrumentation and Control Engineering/Medical Electronics/ Robotics and Automation Engineering)

(Regulations 2013)

(Also common to PTEC 6202 — Electronics Devices and Circuits for B.E. (Part-Time) Second Semester – Electrical and Electronics Engineering – Regulations 2014)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Determine the dynamic resistance of a PN diode at 300 K with $\eta = 1$ and $I = 26$ mA.

2. Differentiate between LED and laser Diode.

3. Define transport factor (β) for a BJT.

4. Calculate the intrinsic standoff ratio of an UJT with $R_{B1} = 5\ k\Omega$ and $R_{BB} = 10\ k\Omega$.

5. For a CB transistor amplifier driven by a voltage source of internal resistance $R_S = 1.2\ k\Omega$, the load resistance $R_L = 1\ k\Omega$. The h parameters, $h_{fb} = 0.98$ and $h_{ob} = 0.5$. Calculate the current gain.

6. What is meant by α cut–off frequency?

7. For a differential amplifier, CMRR = 10^4 and differential gain $A_d = 10^6$. Find the common mode gain.

8. State the need for neutralization in transistor amplifiers.

9. An amplifier has a midband gain of 125 and has a bandwidth of 250kHz. Find the bandwith if a 4% negative feedback is introduced.

10. A crystal has the following parameters, L = 0.5 H, C_1 = Cs = 0.06 pF, C_h = 1 pF and R = 5 kΩ. Find the series resonant frequency of the crystal.

PART B — (5 × 13 = 65 marks)

11. (a) Explain the current flow in a forward biased PN junction with relevant expressions for minority carrier concentration and diagram to illustrate the carrier densities close to depletion layer. Also deduce the expression for total current density. (13)

Or

(b) (i) Enumerate the concept of Zener breakdown in PN junction with its V–I characteristics. (7)

(ii) Outline the construction of a Zener voltage regulator with a neat circuit diagram. (6)

12. (a) Explain the structure and operation of an N channel depletion type MOSFET with relevant characteristics. (13)

Or

(b) With a basic structure of an N channel IGBT; explain its characteristics with a simple equivalent circuit. (13)

13. (a) From the two port model of a BJT amplifier in CE configuration, derive the expressions for input impedance, current gain, voltage gain and output admittance. (13)

Or

(b) Explain the small signal model of a MOSFET under CS arrangement. Also discuss about its frequency response. (13)

14. (a) (i) Illustrate the operation of symmetrical emitter coupled differential amplifier with a neat circuit diagram. (8)

(ii) Deduce the expression for common mode and differential mode gains. (5)

Or

(b) (i) Explain the operation of a class B power amplifier with relevant diagrams. (8)

(ii) Brief about cross over distortion in power amplifiers. (5)

15. (a) Enumerate the characteristics of voltage series feedback amplifier with an example. (13)

Or

(b) Discuss the principle and operation of a Colpitts oscillator with a circuit. Also deduce an expression for frequency of oscillation. (13)

PART C — (1 × 15 = 15 marks)

16. (a) An application circuit requires a voltage controlled resistor component. Which component would you prefer? Enumerate the characteristics of the component, which satisfies the requirement. (15)

Or

(b) Can you use piezo electric effect for electronic oscillator? If so explain a component with such characteristics. Also draw a circuit for the same. (15)