E 1097 (Pages : 4) Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2015

Fourth Semester

Core Course—ELECTRONICS

(Common for B.Sc. Physics Model I, B.Sc. Physics Model II, B.Sc. Physics-EEM and B.Sc. Physics Instrumentation)

[Prior to 2011 Admissions]

Time : Three Hours Maximum Weight : 25

Candidates can use non-programmable scientific calculators / Mathematical tables.

Part A (Objective Type Questions)

Answer **all** *questions.*
This part contains four bunches of four objective type questions each.
Each bunch of four questions carries a weight of 1.

Bunch I

Choose the most appropriate alternative.

1. An increase in load current will cause the ripple voltage to ————.

   (a) Decrease. (b) Increase.
   (c) Stay the same. (d) Drop to zero.

2. The clamper circuits change the ———— of the output waveform.

   (a) Shape. (b) Frequency.
   (c) Bandwidth. (d) d.c. offset.

3. Voltage multiplier circuits are constructed using diodes and ————.

   (a) Capacitors. (b) Inductors.
   (c) Clippers. (d) Only diodes and resistors.

4. When a Zener diode is operating in its Zener breakdown region, a large change in Zener current will produce ————.

   (a) A large change in Zener voltage. (b) A small change in Zener voltage.
   (c) No change in Zener voltage. (d) A large change in forward current flow.

Turn over

Bunch II

Choose the most appropriate alternative.

5. A Zener diode regulator circuit uses a dropping resistor ————.

   (a) In series with the load resistor.

   (b) In parallel with the Zener diode.

   (c) In series with the Zener diode.

   (d) In series with a parallel combination of the load and the Zener diode.

6. Compared to the emitter and collector, the base section of a transistor is :

   (a) Very thick. (b) Very soft.

   (c) Very thin. (d) Very hard.

7. Which of the following is correct ?

   (a) $I_E = I_B + \beta I_C$. (b) $I_C = I_B + I_E$.

   (c) $I_E = I_B + I_C$. (d) $I_B = I_E + I_C$.

8. When a silicon transistor switch is cut-off, V_{CE} is equal to approximately ————.

   (a) V_{CC}. (b) V_B.

   (c) 0.2 V. (d) 0.7 V.

Bunch III

Choose the most appropriate alternative.

9. In voltage divider biased amplifiers, once the DC emitter voltage is calculated, the quiescent collector current can be approximated by dividing the emitter voltage by ————.

   (a) The resistance in the base leg. (b) The resistance in the emitter leg.

   (c) The resistance in the collector leg. (d) The resistance of the load.

10. Which type of voltage divider biased amplifier has the highest input impedance ?

    (a) Fully byepassed. (b) Split-emitter.

    (c) Unbyepassed. (d) All the same.

11. The values of the coupling and byepass capacitors is one of the main factors determining ————.

    (a) Low frequency cut-off. (b) High frequency cut-off.

    (c) Voltage gain. (d) Current gain.

12. The common-collector configuration has a ————.

    (a) High input impedance and low output impedance.

    (b) High input impedance and output impedance equal to R_c.

    (c) Low input impedance and output impedance equal to R_c.

    (d) None of the above.

Bunch IV

Choose the most appropriate alternative.

13. The ———— voltage of a JFET is the drain-to-source voltage where the drain current becomes approximately constant.

    (a) Pinch-off. (b) Cut-off.

    (c) Saturation. (d) Constant rate.

14. The JFET depends on a reverse-biased PN junction for isolation, but the MOSFET uses thin layers of ———— as an insulator between the gate and the channel.

    (a) Glass. (b) Enhanced glass.

    (c) Rubber. (d) Silicon dioxide.

15. What is the main frequency determining factor in Colpitts and Hartley oscillator circuits ?

    (a) The capacitance in the tuned circuit.

    (b) The inductance in the tuned circuit.

    (c) The resonant frequency of the tuned circuit.

    (d) The RC feedback network.

16. The input signal to a differntial amplifier is connected between ————.

    (a) The inverting input and ground.

    (b) The non-inverting input and ground.

    (c) The non-inverting and the inverting inputs.

    (d) The inverting input and the reference pin.

(4 × 1 = 4)

Part B (Short Answer Type Questions)

Answer any **five** *questions.*
Each question carries a weight of 1.

17. Write the diode current equation and explain each term in it.
18. Define the ripple factor. Derive the expression for the same for a bridge rectifier circuit.
19. With a neat circuit diagram, explain how an n-p-n transistor amplifies the weak current signal input.
20. What is Thermal runaway ? Suggest two distinct methods to eliminate the same.
21. Sketch the input and output characteristics of a CB configuration and explain.
22. Draw and explain the operation of a crystal oscillator.
23. With a neat circuit diagram, derive the expression for the voltage gain of a non-inverting amplifier.
24. With neat circuit diagram and waveforms explain how a diode detector demodulates an AM signal.

(5 × 1 = 5)

Turn over

Part C (Short Essays/Problems/Derivation)

Answer any **four** *questions.*
Each question carries a weight of 2.

25. With the help of waveforms and circuit diagram, describe the capacitor filter action in a power supply. Derive expression for its ripple factor.
26. Describe the working of a single circuit which can act as a tripler and quadrupler.
27. With the experimental set up, describe how the CE output characteristics is plotted. Sketch the characteristics and describe its shape.
28. Explain the current stability of the colelctor-to-base feedback bias amplifier circuit, along with its load line characteristics.
29. With a neat circuit diagram, explain the working of a four-input inverting adder. Derive expression of its output voltage.
30. The r.m.s. value of the carrier current in an AM transmitter is 10A, with 100 W. When modulated, the current is increased to 11.6 A, r.m.s. Calculate the total power transmitted ?

$(4 \times 2 = 8)$

Part D (Essays)

Answer any **two** *questions in detail.*
Each question carries a weight of 4.

31. With a neat constructional diagram and VI characteristics, explain the changes taking place inside a Zener diode. How the contact potential is developed and how the Zener breakdown occurs ?
32. Draw and explain the circuit diagram of an RC-coupled CE amplifier with voltage divider bias. Clearly discuss the function of each component. Deduce its a.c. equivalent circuit using h-parameters and derive expression for the input resistance.
33. With a block diagram, derive the expression for the gain with feedback. Draw the block diagram topologies of the four types of negative feedback and explain with equations what happens to the input and output resistances with the four types of negative feedback.

$(2 \times 4 = 8)$