E 1992 (Pages : 4) Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2011

Third Semester

Vocational Course—LINEAR INTEGRATED CIRCUITS

(For the Vocational Subject Applied Electronics of Model-II Physics)

Time : Three Hours Maximum Weight : 25

Answer **all** *questions in Part A.*
This contains 4 bunches of 4 objective type questions.
For each bunch, grade A will be awarded if all the 4 answers are correct, B for 3, C for 2, D for 1 and E for 0.
Answer any **five** *questions from Part B, 4 from Part C and any 2 from Part D.*
Candidates can use nonprogrammable calculators and mathematical tables.

Part A (Objective type)

Answer **all** *questions*
Weight 1 each for each bunch.

Bunch I

Choose the most appropriate alternative :

1. In monolithic ICs, all components are fabricated by ——— process.
   (a) evaporation. (b) sputtering.
   (c) diffusion. (d) oxidation.
2. As compared to monolithic ICs, film ICs have the advantage of :
   (a) better high frequency response.
   (b) much reduced cost.
   (c) smaller size.
   (d) less flexibility in circuit design.
3. Monolithic transistors are formed in the epitaxial N-layer :
   (a) in one operation. (b) by evaporation process.
   (c) by oxidisation. (d) by successive impurity diffusions.

4. In an IC, the silicon dioxide layer provides :

   (a) electrical connection to the external circuit.

   (b) Physical strength.

   (c) isolation.

   (d) conducting path.

Bunch II

Choose the most appropriate alternative :

5. Since input resistance of an ideal op-amp is infinite :

   (a) its output resistance is zero.

   (b) its output voltage becomes independent of load resistance.

   (c) its input current is zero.

   (d) it becomes a current controlled device.

6. When an input voltage of IV is applied to a 741 op-amp having $A_v = 10^6$ and bias supply $\pm 15V$, the output voltage available is :

   (a) 15×10^6 V. (b) 10^6 V.

   (c) 15μV. (d) 15V.

7. The purpose of comparator is to :

   (a) amplify an input voltage.

   (b) detect the occurrence of a changing input voltage.

   (c) maintain a constant output when the dc input voltage changes.

   (d) produce a change in input voltage when an input voltage equals the reference voltage.

8. The feedback path in an op-amp differentiator consists of :

   (a) a resistor.

   (b) a capacitor.

   (c) a resistor and a capacitor in series.

   (d) a resistor and a capacitor in parallel.

Bunch III

State whether True *or* False :

9. Active filter circuits provide voltage gain and provide loading.

10. The op-amp voltage follower circuit produces a 180° phase shift between the input and output voltages.

11. The slew rate of an ideal op-amp is zero.

12. Notch filter is a band pass filter.

Bunch IV

Fill in the blanks :

13. An op-amp integrator circuit can also be used as a ——— filter.

14. The maximum output current that can be delivered from a 555 IC is ———.

15. The lock range of a PLL is ——— than its capture range.

16. The foundation on which an IC is built is called ———.

(4 × 1 = 4)

Part B (Short answer questions)

Answer any **five** *questions.*
Weight 1 *each.*

17. Explain how ICs are classified according to the scale of integration.

18. In ICs, the substrate is not employed as collector. Why ?

19. Why open-loop op-amp circuits are not used in linear applications ?

20. Draw the circuit diagram of a difference amplifier using op-amp.

21. Draw the circuit of a regenerative comparator using op-amp and also sketch its voltage transfer characteristics.

22. Why normally the control terminal (Pin 5) of 555 is connected to ground through a 0.01μF capacitor ?

23. Name any *four* applications of PLL.

24. Define lock range and capture range of PLL ?

(5 × 1 = 5)

Part C (Short Essay/Problems)

Answer any **four** *questions.*
Weight 2 *each.*

25. With neat diagrams, show how a (i) resistor, (ii) capacitor, (iii) diode and (iv) transistor is constructed on a monolithic integrated circuit ?

26. Draw the circuit of a non-inverting amplifier using op-amp and write expression for its voltage gain. Locate the virtual short point in the circuit and explain its significance.

27. Draw the circuit of a crystal oscillator using op-amp and explain its working.

28. Draw the circuit of a second order active high pass filter and plot its frequency response.

29. Discuss how FM demodulation can be achieved using PLL .

30. With a circuit diagram, show how 555 can be used as a VCO ?

(4 × 2 = 8)

Part D (Essay type questions)

Answer any **two** *questions.*
Weight 4 *each.*

31. With neat diagrams, describe the photolithographic method to fabricate monolithic ICs.

32. Draw the circuit of an inverting summing amplifier to sum four inputs. Derive expression for the output voltage.

33. Draw the circuit of a triangular wave generator using op-amp and with appropriate waveforms explain its working.

(2 × 4 = 8)