Total No. of Questions : 40] **Code No. 40**

Total No. of Printed Pages : 7]

June/July, 2010

ELECTRONICS

Time : 3 Hours 15 Minutes] [Max. Marks : 90

Note : i) The question paper has *four* **Parts A**, **B**, **C** & **D**.

ii) Question No. **23** in **Part C** and Question No. **32** in **Part D** are from practicals.

iii) Read the instructions given for each Part.

PART – A

Note : Answer *all* questions. 10 × 1 = 10

1. Which region of a transistor is moderately doped ?

2. Write one application of CC amplifier.

3. Define closed loop gain.

4. What is a comparator ?

5. What should be the minimum voltage gain of an amplifier in the case of Wien-bridge oscillator to produce sustained oscillation ?

6. Define signal to noise ratio.

7. A carrier is frequency modulated by a signal of frequency 5 kHz to a depth of 4. What is its frequency deviation ?

8. Write the excess-3 code of $(29)_{10}$.

9. What is an XNOR gate ?

10. Mention the basic function of transponder.

[Turn over

PART – B

Note : Answer any *ten* questions. 10 × 2 = 20

11. Explain the need for biasing a transistor.

12. Show that $(1+\beta)=\frac{1}{1-\alpha}$. (Symbols have their usual meaning.)

13. Draw the circuit diagram of opto-coupler.

14. The current gain of a transistor in CB mode is 0·995 and its base current is 20 μA. Calculate its collector current.

15. Distinguish between negative feedback and positive feedback.

16. The output voltage of an amplifier reduces to 0·8 V when a negative feedback of 2% is employed. If the net input voltage of the amplifier is 100 mV, calculate gain of the amplifier without feedback.

17. Define slew rate of an operational amplifier. Write any two characteristics of an ideal op-amp.

18. Design op-amp negative adder to get an output expression

    $V_0 = -(0 \cdot 2\, V_1 + 3\, V_2)$

    Given : $R_2 = 2\ \text{k}\Omega$

19. Briefly explain how an ionosphere helps in transmitting radio signals over large distance.

20. Mention any four reasons for modulating a radio signal.

21. What is a weighted code ? Give an example.

22. What is Metropolitan Area Network (MAN) ? Write one advantage of voice mail.

PART – C

I. Answer the following question : 1 × 4 = 4

23. The following readings were obtained while studying CE amplifier. Draw the frequency response curve and determine frequency bandwidth of the amplifier.

Given : $V_i = 20$ mV

f in Hz	50	100	1 K	200 K	400 K	600 K
V_0 in volt	1·0	1·4	2·0	2·0	1·4	1·0

OR

The following readings were obtained in an op-amp phase shift oscillator experiment.

Calculate experimental and theoretical frequencies of the oscillator.

$(R_1 = R_2 = R_3 = R ;\ C_1 = C_2 = C_3 = C)$

Sl. No.	C in μF	R in Ω	Period T in ms	Frequency	
				Experimental	Theoretical
1	0·1	820	0·52		
2	0·2	680	0·85		

II. Answer any *five* questions : $5 \times 4 = 20$

24. Explain, with a mathematical equation, as to how the operating point is stabilized in potential divider bias. Why is it called universal bias ?

25. In a single stage CE amplifier with voltage divider bias, the following components are used.

$R_1 = 47\ k\Omega,\ R_2 = 12\ k\Omega,\ R_C = 2{\cdot}2\ k\Omega,\ R_E = 1\ k\Omega.$

Calculate :

i) γ_{in} at base

ii) A_V.

Given : $V_{CC} = 15$ V , β of silicon transistor used is 80.

26. With a block diagram, derive an expression for the output impedance of a voltage series feedback amplifier.

27. How is the oscillation initiated in an RC oscillator ? What are the drawbacks of RC oscillator over LC oscillator ?

28. An AM wave is represented by

$V_{AM} = 100\left(1 + 0{\cdot}8 \sin \pi \times 10^4 t\right) \sin 2\pi \times 10^6 t$. It is transmitted through an antenna of resistance 50 Ω. Calculate

i) total power

ii) carrier power of the AM wave.

29. Derive an expression for the instanteneous voltage of an FM wave.

30. With a circuit diagram, using SR flipflop, explain the working of JK flipflop. What is race around condition ?

31. What is a NAND gate ? Simplify the Boolean expression, $Y = \left(\overline{A} + B + C\right)\left(\overline{A} + B + \overline{C}\right)$ and realise the simplified equation using only NOR gates.

PART – D

I. Answer the following question : 1 × 6 = 6

32. Describe an expreiment to realise NOT, OR, AND and XOR using IC 7400 and to verify truth table. Draw the pin diagram of IC 7400.

OR

Draw the pin diagram of IC 741. Describe an experiment to study op-amp as subtractor using *dc* source.

II. Answer any *five* questions : 5 × 6 = 30

33. a) With a circuit diagram, explain the working of direct coupled amplifier. Show the frequency response. 4

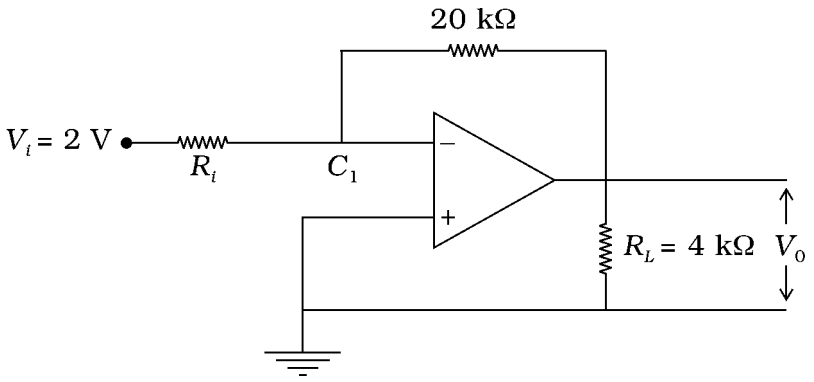
b) In a cascaded amplifier voltage gains of first and third stages are respectively 5 and 10. The overall gain is 400. Calculate voltage gain of the second stage. 2

34. a) Derive the expressions for output resistance, input resistance (looking at the source terminal) and voltage gain of a single stage CE amplifier using r_e model. 4

b) The output resistance of a CE amplifier of voltage gain 200, is 2 kΩ. If the transistor is of silicon material, calculate its emitter current. 2

35. a) With a circuit diagram derive an expression for voltage gain of op-amp non-inverting amplifier. 4

b)



Current through R_L is 2 mA.

Calculate current through R_i and the value of R_i. 2

36. a) With a circuit diagram, explain the working of Colpitts oscillator. Mention the expression for frequency of oscillation. 4

b) The frequency measuring components used in the Hartley oscillator circuit are $L_1 = 15\,\mu H$, $L_2 = 5\,\mu H$ and C = 20 μF. Calculate the frequency of the oscillator. 2

37. a) Draw the block diagram of SHDAM receiver and explain briefly the function of each block. 4

b) In a SHDAM receiver, two signals of frequencies 600 kHz and 1450 kHz are received simultaneously. Calculate local oscillator and intermediate frequencies of the receiver. 2

38. Using Karnaugh map simplify the following expression :

$Y\ (A, B, C, D) = \Sigma m\ (0, 1, 6, 7, 8, 9, 15)$ and the don't care conditions $d\ (A, B, C, D) = \Sigma m\ (5, 14)$. Draw the NAND gate equivalent circuit to realise the simplified equation. 6

39. a) Draw the labelled block diagram of digital computer. Briefly explain the function of each block. 4

b) What is a half-adder ? Write the Boolean expression for the output of carry of the full adder. 2

40. a) Explain the concepts of frequency reuse and cell splitting in cellular systems. 4

b) What is interlaced scanning ? Write its main advantage over sequential scanning. 2