

Code No. 40

Total No. of Questions : 40]

[Total No. of Printed Pages : 7

June / July, 2009

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. Write the biasing conditions of a transistor to operate in saturation region.
2. What is a difference amplifier ?
3. What happens to the distortion of an amplifier when the negative feedback is applied ?
4. Why is input current drawn by an ideal op-amp zero ?
5. How is the frequency related to the thickness of crystal in a crystal oscillator ?
6. Does the loudspeaker respond to an audio signal ?
7. What is the bandwidth of an AM wave whose carrier of frequency 600 kHz is modulated by a signal of 1.5 kHz ?
8. What is a quad ?
9. When does the output of a SR flip-flop set ?
10. Define aspect ratio.

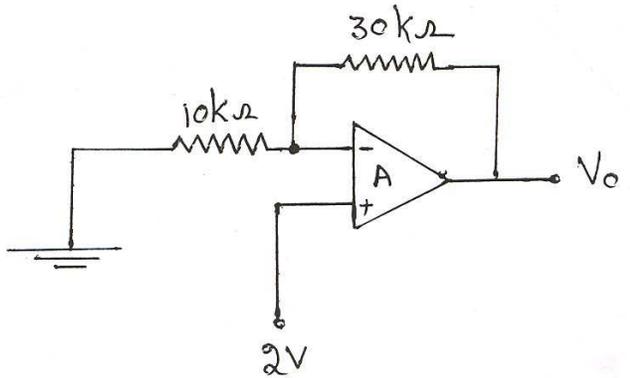
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PART - B

Note : Answer any ten questions.

10 × 2 = 20

11. Show that $\beta = \alpha (1 + \beta)$. Symbols have their usual meaning.
12. Mention the two important steps to obtain the d.c. equivalent circuit.
13. Calculate the emitter resistance r_e of a small signal amplifier and its base current if $\beta = 60$, $V_T = 26\text{mV}$ and $I_E \approx I_C = 2\text{mA}$.
14. Draw the block voltage series feedback and current shunt feedback amplifiers.
15. Calculate the output voltage in the following circuit :



16. What is the Barkhausen criterion for sustained oscillations ?
17. Define the following terms in case of radio communication :
 - i) Skip distance
 - ii) Critical angle.
18. What is demodulation ? Mention any two types of AM detection.
19. Realise OR and AND gates using NOR gates.
20. Convert $Y = A\bar{B} + \bar{B}\bar{C}$ into canonical SOP form.
21. Draw the block diagram of a digital computer.
22. What is browsing ? What does www stand for ?

PART - C

I. Answer the following question :

1 × 4 = 4

23. Using the following data, calculate the theoretical and experimental values of voltage gain for an inverting op-amp.

$$V_{in} = 1.25V$$

Trial No.	R_i in (k Ω)	R_f in (k Ω)	V_o in volts	Voltage Gain	
				Theoretical	Experimental
1	10	33	-4.1		
2	12	56	-5.8		

OR

Using the following data, calculate the frequency of oscillation for a Wien-bridge oscillator. Compare the theoretical and practical values.

Trial No.	R_i in (k Ω)	C in μF (k Ω)	T in ms	Frequency	
				Theoretical	Practical
1	1	0.1	0.63		
2	5	0.01	0.32		

$$(R_1 = R_2 = R ; C_1 = C_2 = C)$$

II. Answer any *five* questions :

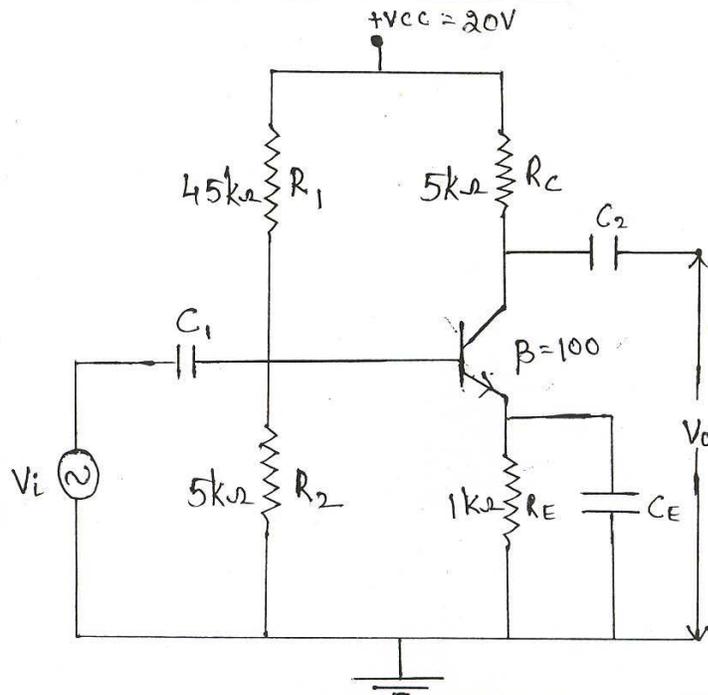
5 × 4 = 20

24. Draw the circuit diagram of CC-amplifier. Why is it called emitter follower ? Explain.
25. For the transistor CE-amplifier circuit given below, determine

- i) r_e ii) A_v iii) A_i iv) Z_o .

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Given : $V_{BE} = 0.7 \text{ V}$ and $r_e = \frac{50\text{mV}}{I_E}$.



26. Explain with a frequency response curve, how a negative feedback in amplifier modifies the bandwidth.
27. Derive an expression for output voltage of a three-input inverting op-amp adder.
28. With the help of circuit diagram, explain the working of Colpitts oscillator. Write the expression for frequency of oscillation.
29. Derive an expression for the instantaneous voltage of an AM wave.
30. An FM wave is represented by

$$V_{FM} = 20 \sin [6.2 \times 10^8 t + 4.1 \sin 6.28 \times 10^4 t]$$
 Calculate (i) Frequency deviation and (ii) Bandwidth of FM wave.
31. With a circuit and truth table, explain the working of DTL NAND gate.

PART - D

I. Answer the following question :

1 × 6 = 6

32. Describe an experiment to study the frequency response curve of a transistor CB - amplifier.

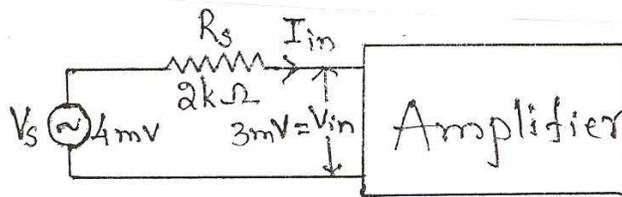
OR

Describe an experiment to construct Half Adder circuit using IC-7400 and verify its truth table.

II. Answer any *five* questions :

5 × 6 = 30

33. a) Draw the circuit diagram of voltage divider bias. Obtain an expression for coordinates of quiescent point (Q-point). 4
- b) Calculate the value of β , if $\alpha = 0.98$. 2
34. a) Draw the circuit of a single input balanced output differential amplifier. What is a phototransistor ? Mention its any two applications. 4
- b) Calculate the input impedance of the following circuit. 2



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35. a) Derive an expression for output voltage of an op-amp integrator circuit. 4
- b) Draw the circuit of op-amp differentiator. Sketch the output waveform for a triangular wave input. 2
36. a) With a circuit diagram, explain the working of RC phase shift oscillator. Write the expression for frequency of oscillation. 4
- b) In a Hartley oscillator, the effective inductances of two inductors is $15\mu\text{H}$ and the capacitance in the tank circuit is $0.47\mu\text{F}$. Determine the frequency of oscillation. 2
37. Draw the block diagram of AM superheterodyne receiver. Briefly explain the function of each block. 6
38. a) Construct master-slave flip-flop using the block diagrams of JKFF. Write its truth table. How does it eliminate race around condition ? 4
- b) Write the excess-3 code of $(46)_{10}$. 2

39. a) Using Karnaugh map, simplify the expression

$$Y = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}B\bar{C}\bar{D} + AB\bar{C}\bar{D} + A\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}CD + \\ \bar{A}BCD + \bar{A}\bar{B}C\bar{D} + ABC\bar{D} + A\bar{B}C\bar{D} + \bar{A}BC\bar{D}$$

Draw the NAND gate circuit to realise the simplified expression. 4

- b) Implement conversion of $(1011)_G$ into binary number using XOR gates. 2

40. Draw the block diagram of monochrome TV transmitter. Briefly explain the function of each block. 6
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