Subject Code : 40

March, 2014   **ELECTRONICS**

Time : 3 Hours 15 Minutes | | Total No. of Questions : 40]   [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 practical.

iii)   Read the instructions given for each part.

iv)   Draw circuit diagrams and waveform wherever necessary.

PART – A

Answer *all* questions.   10 × 1 = 10

1.   Draw a circuit symbol of NPN transistor.

2.   Name the transistor amplifier which has phase shift of 180° between input and output voltages.

3.   What happens to gain bandwidth product of an amplifier when negative feedback is applied ?

4.   Which circuit of an Op-Amp converts analog to digital ?

5.   Name the RC oscillator which does not have phase shift in feedback network.

6.   Define skip distance.

7. Define modulation index in FM.

8. What is a NAND gate ?

9. What is a gray code of (1101)$_2$?

10. What is a down link signal ?

PART - B

Answer any *ten* questions. $10 \times 2 = 20$

11. The differential gain and common mode gain of a differential amplifier are respectively 10500 and 1·75. Calculate CMRR.

12. What is an opto-coupler ? Mention one application of it.

13. The open loop gain of an amplifier is 1000. If the feedback factor is 0·013, calculate closed loop gain.

14. Draw a block diagram of current shunt feedback and label it.

15. What is buffer amplifier ? Draw the circuit diagram of buffer amplifier.

16. Calculate the output voltage in the following circuit :
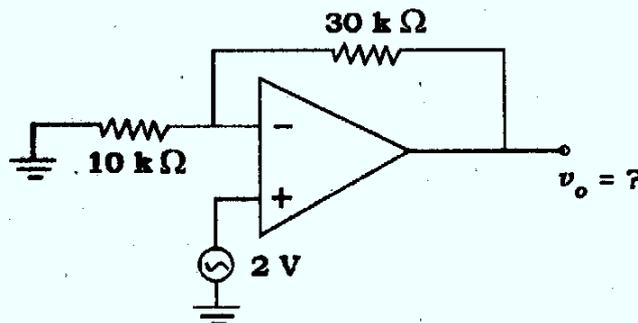
17. What is an ionosphere ? Define critical frequency.

18. Draw AM wave when $m_a = 1.5$.

19. Draw the truth table of D-flip-flop.

20. Convert $Y = \overline{A} + BC$ into canonical SOP form.

21. Convert $(29)_{10}$ into excess-3 code.

22. Write any two advantages and disadvantages of E-mail.

PART – C

I. Answer the following questions :

$1 \times 4 = 4$

23. In a Wien-bridge oscillator experiment following readings are obtained. Calculate theoretical and experimental frequencies, where $R_1 = R_2 = R$ and $C_1 = C_2 = C$.

Sl. No.	R (kΩ)	C (μF)	T (ms)
1.	680	0·1	0·43
2.	820	0·2	1

OR

Calculate theoretical and experimental voltage gain of inverting amplifier from the following readings :

Input voltage $V_i = 0.5\,V$.

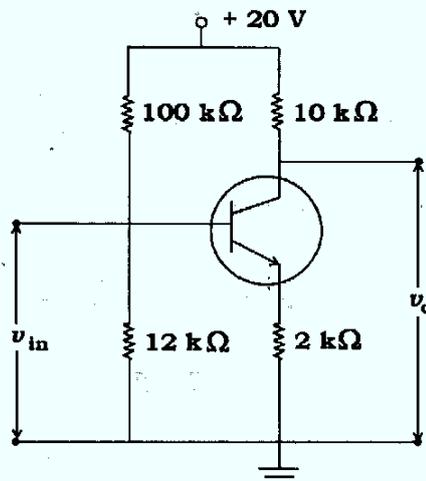| Sl. No.	R_i (kΩ)	R_f (kΩ)	V_o (volt)
1.	0·50	10·0	10·15
2.	1·0	8·2	4·21

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II. Answer any *five* questions :   5 × 4 = 20
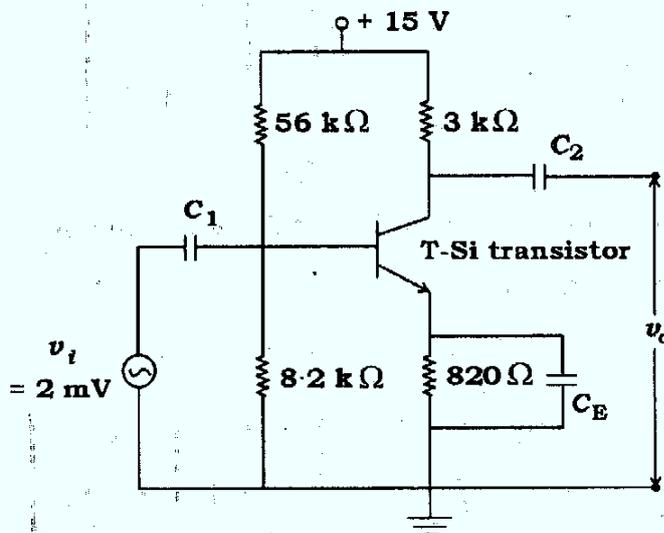
24. Find the co-ordinates of the operating point for following circuit :

($V_{BE} = 0 \cdot 7 \, V$)

25. Compare *CB*, *CC* and *CE* amplifiers.

26. Calculate output voltage v_o for the following circuit :

Given, $r'_e = \dfrac{26 \text{ mV}}{I_E}$.

Assume source resistance as zero.

27. With a block diagram derive an expression for output impedance of voltage series feedback.

28. With a circuit diagram explain the working of Colpitts oscillator. Write the expression of its frequency of oscillations.

29. The side band power of an AM wave is 250 W when the modulation index is 0·8. Calculate total power and carrier power.

30. Derive an expression for instantaneous voltage of an AM wave.

31. What is a full adder ? Draw the circuit of full adder using 2-input XOR and basic gates.

PART – D

1 × 6 = 6

I. Answer the following question :

32. Draw the pinout diagram of IC 7402. Describe an experiment to verify the truth table of NOT, AND, OR, XOR gates.

OR

Describe an experiment to draw frequency response and hence find frequency bandwidth of CB amplifiers.

5 × 6 = 30

II. Answer any *five* questions :

33. a) With a circuit diagram, explain the working of NPN transistor.

4 + 2

   b) If α of a transistor is 0·98, calculate β of the transistor.

34. Draw the circuit diagram and frequency response of single-stage CE amplifier. Draw the *dc* and *ac* equivalent circuit of it.

35. a) What is an Op-Amp differentiator ? With circuit diagram, derive an expression for output voltage of an Op-Amp differentiator.

    b) In an Op-Amp inverting amplifier the value of input and feedback resistors used are 500 Ω and 7·5 kΩ. Calculate output voltage when 0·5 V is given at its input.   4 + 2

36. a) The value of R and C used in the phase shift network of an RC phase shift oscillator are 680 Ω and 1 μF.

    Calculate the frequency of oscillations. Suppose only 1 μF capacitor is replaced by 0·2 μF. What is the new frequency of oscillation ?

    b) Draw the equivalent circuit of a crystal used in crystal oscillator.   4 + 2

37. a) Draw the block diagram of SHD FM radio receiver. Briefly explain the function of each block.

    b) The frequency deviation of an FM wave is 54 kHz for modulation index 6. Calculate frequency of the modulating signal.   4 + 2

38. a) Simplify the following Boolean equation using *K*-map :

    $Y(A,B,C,D) = \sum m(0,5,7,10,11,13,15) + \sum d(3,4,12,14)$.

    b) Draw the block diagram of digital computer.   4 + 2

39. a) Draw the circuit diagram of a master-slave flip-flop using two JK flip-flops.

How is race around condition eliminated in this flip-flop ? Explain.

b) Is a gray code a weighted or non-weighted code ? Mention one self complementary code.

4 + 2

40. Draw the block diagram of TV transmitter and briefly explain the function of each block.

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