F 2986

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Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, DECEMBER 2012

Third Semester

Branch : Information Technology

IT 010 303—DISCRETE AND INTEGRATED ELECTRONIC CIRCUITS (IT)

(New Scheme—Regular/Improvement/Supplementary)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all *questions.*
Each question carries 3 *marks.*

1. Define ripple factor. Give the values for half wave, centre-tapped and bridge rectifiers.
2. State the bias conditions of a BJT in (i) active ; (ii) saturation ; and (iii) cut-off regions.
3. Draw the voltage follower circuit and write its R_i, R_o and A_v.
4. Prove that for a feedback amplifier $A_f = \frac{A}{1 + AB}$.
5. Write any three distinct applications of an astable multivibrator.

(5 × 3 = 15 marks)

Part B

Answer all *questions.*
Each question carries 5 *marks.*

6. Draw the circuit of a simple Zener shunt. Voltage regulator and explain how it regulates the output voltage against variations in input voltage and output current.
7. Explain the operation of a transistor in saturation and cut-off regions. Explain how it can be used as a digital switch ?
8. Explain the concept of virtual short in an op-amp with the help of a neat circuit diagram. What are the conditions to be satisfied to get the virtual short ?
9. In a Colpitts oscillator, $C_1 = C_2 = C$ and L = 100 μH. The frequency of oscillations is 500 kHz. Determine the value of C.
10. Draw the circuit diagram of RC integrator and draw the output waveforms when a square wave input of ± 5V, 1 kHz is applied with input frequencies (i) $f = \frac{1}{T} \ll \frac{1}{RC}$; (ii) $f = \frac{1}{T} = \frac{1}{RC}$; (iii) $f = \frac{1}{T} \gg \frac{1}{RC}$.

(5 × 5 = 25 marks)

Turn over

Part C

Answer any **one** *full question from each module.*
Each full question carries 12 marks.

MODULE I

11. (a) A full wave bridge rectifier supplies a load of 500 Ω in parallel with a 500 μF. If the a.c. supply is 230 V sin 314 t, with a 0–12 V transformer, find (i) ripple factor ; (ii) d.c. load current ; and (iii) efficiency. Draw the circuit.

(7 marks)

(b) Explain the action of CLC filter circuits connected to a full wave rectifier with neat circuit diagram and waveforms.

(5 marks)

Or

12. (a) Explain the neat circuit of a capacitor filter with necessary waveforms. Derive expression for its ripple factor.

(7 marks)

(b) An LC circuit is to be used as a filter to provide a d.c. output with 1 % ripple, when operating from a full wave rectifier operating at 50 Hz. To conserve the size of choke, $\frac{L}{C} = 0.01$ is recommended. Determine the values of L and C.

(5 marks)

MODULE II

13. (a) Compare the performance of BJT in three configurations in terms of A_v, A_i, R_i, R_o and area of applications.

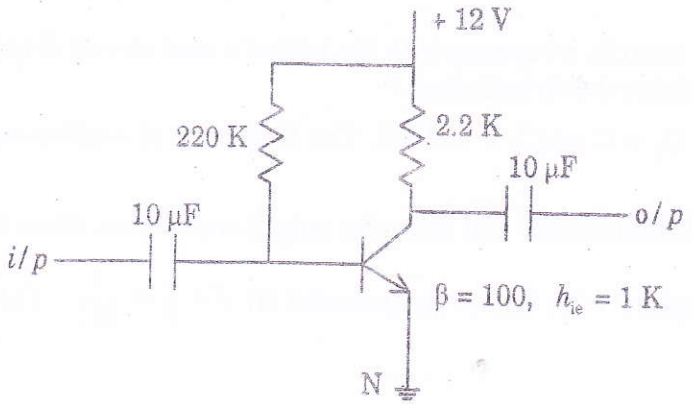
(9 marks)

(b) In a CE amplifier, the effective base circuit resistance to the input signal is 10 kΩ and the effective collector load resistance is 4 kΩ. If $h_{fe} = 400$, obtain the value of voltage gain of the circuit, neglecting the effect of other hybrid parameters.

(3 marks)

Or

14. (a) Determine the following for the circuit shown in figure :



(i) I_{CQ} ; (ii) V_{CEQ} ; (iii) V_{BN} ; (iv) V_{CN} ; (v) Draw the d.c. load line. (6 marks)

(b) Draw the input and output characteristics of CB transistor and explain the shapes.

(6 marks)

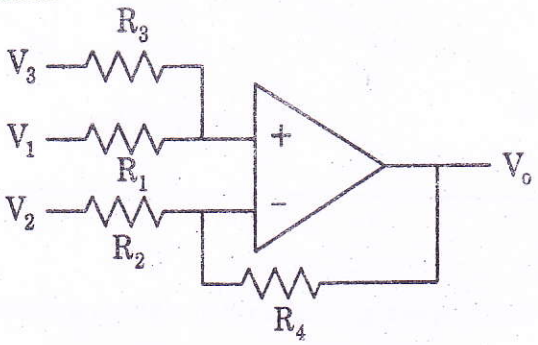
MODULE III

15. In the following circuit $V_o = V_1 \pm 2V_2 - V_3$. Find the values for R_1, R_2, R_3 and R_4. Also find the values of V_o if

    (i) R_4 is short circuited.

    (ii) R_4 is removed.

    (iii) R_1 is short circuited.



(12 marks)

Or

16. Draw the circuit of a non-inverting amplifier. Derive expressions for its voltage gain, input and output resistances. Compare these three properties with that of inverting amplifier.

(12 marks)

MODULE IV

17. (a) What is a negative feedback ? Show that negative feedback improves stability, modifies the input and output resistances and reduces distortion in amplifier.

(8 marks)

(b) An amplifier has 60 dB gain. It has an output impedance Z_o = 12 kΩ. It is required to modify this impedance to 600 Ω by applying negative feedback. Calculate the value of the feedback factor. Also find the percentage change in the overall gain, for 10 % change in the gain of the internal amplifier.

(4 marks)

Or

18. The three sections of RC of the RC phase-shift oscillator has R = 10 kΩ and C = 0.001 μF.

    (i) What is the frequency of oscillation ?

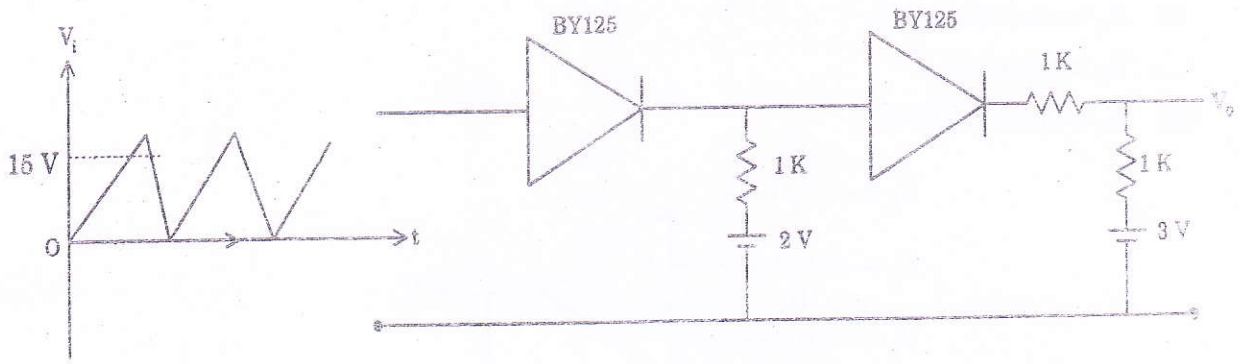
    (ii) If the oscillator is to be made variable with no change in R, what should be the tuning range of the capacitors for a frequency range of 1 to 100 kHz ?

    (iii) Draw and explain the working of the circuit ?

(12 marks)

MODULE V

19. (a) Plot V_o versus V_i and V_o versus t for the following and explain :



(9 marks)

(b) State and explain, any two distinct applications of clamping circuits. (8 marks)

Or

20. With a neat circuit and waveforms explain the working of an astable multivibrator using op-amp. Derive the expression for its frequency.

(12 marks)

[5 × 12 = 60 marks]