Answer ALL questions

PART – A   **(10×2=20 Marks)**

1. What is return ratio of feedback amplifier ?

2. What happens to the input resistance based on the type of feedback in an amplifier ?

3. What is Barkhausen criterion ?

4. In a Hartley oscillator, if $L_1 = 0.2$ mH, $L_2 = 0.3$ mH and $C = 0.003$ μF. Calculate the frequency of its oscillations.

5. What is the effect of Q on the resonance circuit ?

6. Draw the ideal response and actual response of tuned amplifiers.

7. What are the different types of multivibrator ?

8. Mention the uses of Schmitt trigger circuit.

9. Design an RC circuit to generate an output voltage, V_0 with a slope error of 20% and sweep time of 20 μs and a sweep voltage of 2 V.

10. Draw the schematic diagram of a free running blocking oscillator.

11. a) Draw the circuit diagram of a single stage Common Emitter amplifier that uses emitter current feedback. Analyse the circuit and derive equations for gain, input and output impedance with feedback.

(OR)

b) With the help of a neat schematic (topology), discuss the classification of feedback amplifiers. Discuss qualitatively, the effect of topology of a feedback amplifier on input and output resistance. Also derive the expression for input and output resistance of shunt-series feedback amplifier.

12. a) i) Identify the nature of feedback in Figure 1. Let $R_{C1} = 3$ KΩ, $R_{C2} = 500$ Ω, $R_E = 50$ Ω, $R_S = R_F = 1.2$ KΩ, $h_{fe} = 50$, $h_{ie} = 1.1$ KΩ, $h_{re} = h_{oe} = 0$. Determine overall voltage gain (A_{vf}), overall current gain (A_{if}), input impedance (R_{if}) and output impedance (R_{of}). **(5)**
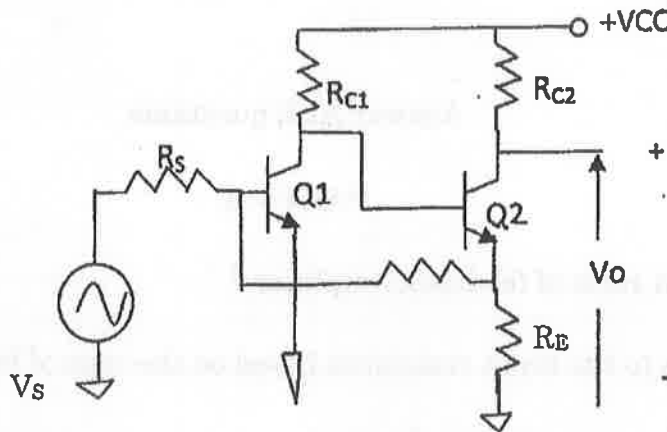

Figure 1

ii) A multipole amplifier having a first pole at 1 MHz and an open loop gain of 100 dB to be compensated for closed loop gain, as low as 20 dB by introducing of a new dominant pole. At what fequency must the new pole be placed ? **(5)**

iii) Identify the type of feedback amplifiers shown in Figure 2(a) and 2(b). **(3)**
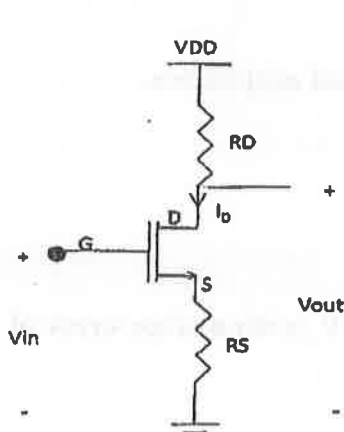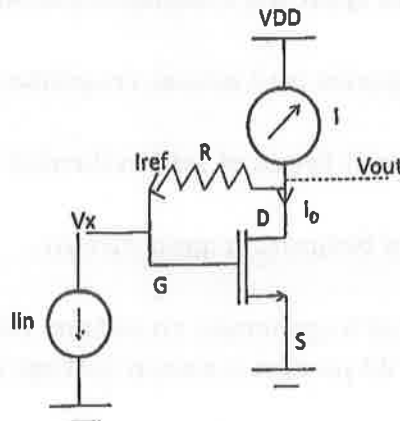

Figure 2(a)   Figure 2(b)

(OR)

b) i) Determine the voltage-gain, input impedance and output impedance of transistor based voltage series feedback amplifier. **(6)**

ii) Consider a three-pole feedback amplifier with a loop gain given by

$$T(f) = \frac{5 \times 10^5}{\left(1 + j\frac{f}{10^6}\right)\left(1 + j\frac{f}{10^7}\right)\left(1 + j\frac{f}{10^8}\right)}$$

Determine the frequency of the dominant pole to stabilize the feedback system. Assume the phase margin is atleast 45°. **(7)**

13. a) i) Draw the circuit of class C tuned amplifier and explain its operation with relevant waveforms. Discuss also its frequency response. **(8)**

ii) With a neat circuit diagram, explain the Hazeltine method of neutralization. **(5)**

(OR)

b) Draw the circuit of a double-tuned amplifier and explain its operation sketch the nature of frequency-gain characteristics and write the expression for 3-dB bandwidth. **(13)**

14. a) i) With a relevant circuit diagram and waveforms, explain the working and operation of Bistable multivibrator. **(10)**

ii) Draw and explain positive clamper. **(3)**

(OR)

b) i) Obtain the output voltage of RC integrator circuit with the step input voltage applied at $t = t_1$. Also obtain the expression for the output voltage. **(9)**

ii) Obtain the output voltage V_{Out} in the circuit given in Figure 3. **(4)**
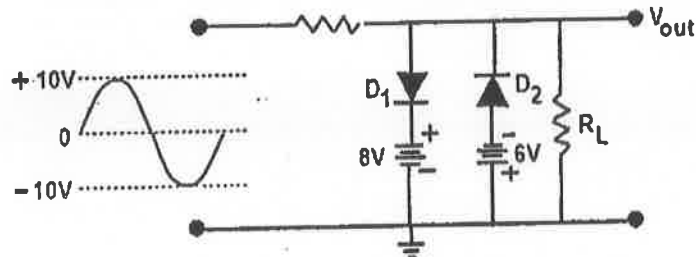

Figure 3

15. a) Briefly describe about the working of UJT for relaxation oscillator with the help of suitable circuit diagram and derive its frequency of oscillation.

(OR)

b) Analyze free running blocking oscillator with base timing using necessary circuit diagram and waveform.

PART – C   (1×15=15 Marks)

16. a) i) Design an astable multivibrator to generate a square wave of 2 kHz frequency with a duty cycle of 35% .   (7)

ii) Mention the significance of Gain-Bandwidth product of amplifiers with an example.   (3)

iii) An amplifier consists of 3 identical stages in cascade. The bandwidth of overall amplifiers is 20 Hz to 20 kHz. Calculate the bandwidth of individual stage.   (5)

(OR)

b) For a UJT sweep circuit the resistance is 10 kΩ while capacitance is 0.1 μF, valley potential is 1.5 V, VBB = 20 V. Assuming diode cutin voltage of 0.7 V and intrinsic stand off ratio as 0.6. Calculate the frequency of oscillation.

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