

(viii) In the circuit shown in the Fig. 1 below, the output voltage is

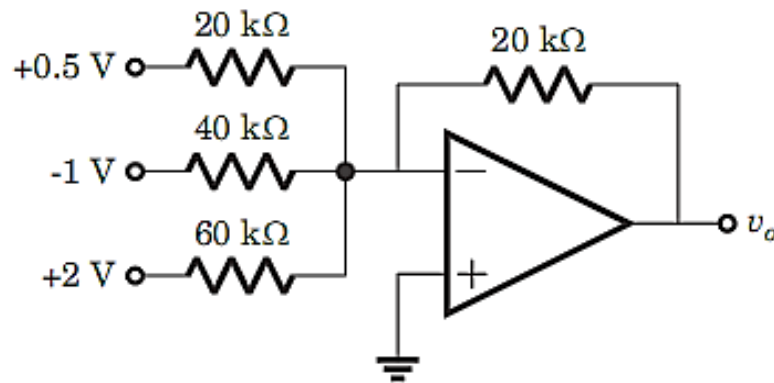


Fig. 1

- (a) 2.67V (b) -2.67V (c) 2.67V (d) -2.67V.

(ix) Which of the following is a characteristic of an ideal OPAMP?

- (a) Infinite input impedance and zero output impedance
 (b) Zero input impedance and infinite output impedance
 (c) Infinite bandwidth and low input impedance
 (d) High output impedance and finite bandwidth.

(x) Class A amplifier, the transistor conducts for how much of the input signal cycle?

- (a) 90 degrees (b) 180 degrees
 (c) 270 degrees (d) 360 degrees.

Fill in the blanks with the correct word

- (xi) In a common-emitter amplifier, the phase shift between the input and output signals is _____ degrees.
- (xii) A _____ circuit is used to maintain a constant output voltage regardless of changes in the input voltage or load conditions.
- (xiii) The _____ point is the operating point on a transistor's characteristic curve where it functions linearly and provides the desired amplification.
- (xiv) The _____ input impedance of an operational amplifier ensures that the amplifier does not load the preceding stage.
- (xv) The 3dB cutoff frequency is defined as the point where the gain of the amplifier falls to _____ % of its mid-band value.

Group - B

2. (a) What is a load line? Explain the concept of Q-point. [[CO2](Remember/LOCQ)]
- (b) For CE configuration prove that $I_C = \beta I_B + (1 + \beta) I_{CO}$, where the symbols have their usual meaning. [[CO2](Apply/IOCQ)]
- (c) In a collector to base bias circuit indicated in Fig. 2, a transistor with $\beta = 50$ is used. Supply voltage $V_{CC} = 10V$, $V_{BE} = 0.7V$, collector resistor $R_C = 2k\Omega$. The bias is obtained by connecting $100k\Omega$ resistor R_B from collector to base. Find the Q-point and stability factor.

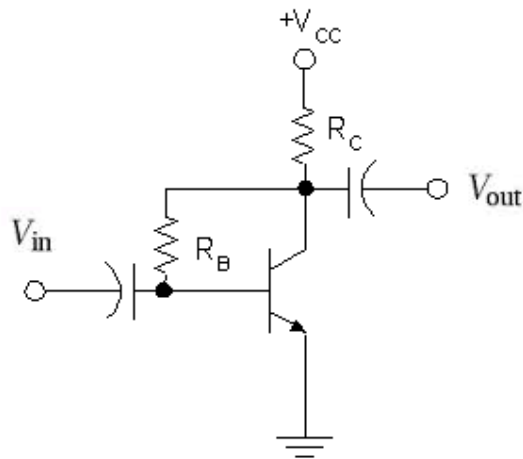


Fig.2

[[CO2](Evaluate/HOCQ)]

4 + 3 + 5 = 12

3. (a) The input signal V_i is a sinusoid having an amplitude of 10V, $V_{B1}=8V$ and $V_{B2}=6V$ shown in Fig. 3. Draw the output voltage waveform V_o . Diodes D_1 and D_2 are ideal.

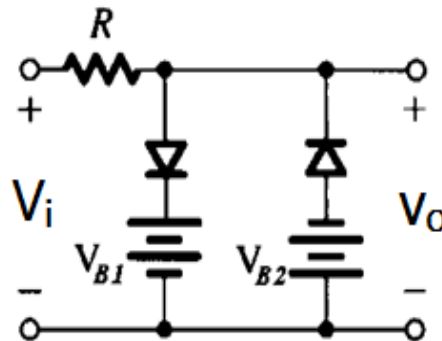


Fig. 3

[[CO1](Evaluate/HOCQ)]

- (b) Explain the operation of a positive clamper circuit with the help of a circuit diagram and input output waveforms.

[[CO1] (Analyze /IOCQ)]

8 + 4 = 12

Group - C

4. (a) Derive the Barkhausen criterion of oscillation that must be satisfied by a feedback amplifier to produce steady state oscillations. [[CO4](Apply/IOCQ)]
- (b) A Wien-Bridge oscillator has ($R_1 = R_2 = 100 \text{ k}\Omega$) and ($C_1 = C_2 = 10 \text{ nF}$). Calculate the frequency of oscillation. [[CO4](Apply/IOCQ)]
- (c) Explain how the angle criteria of the Barkhausen criterion is satisfied in the Phase shift oscillator with the help of its circuit diagram. [[CO4](Apply/IOCQ)]

4 + 4 + 4 = 12

5. (a) With the help of a circuit diagram, explain the working of a Colpitts Oscillator. Derive the expression for the frequency of oscillation in terms of inductance and capacitance in the Colpitts Oscillator circuit. [[CO4](Analyse/IOCQ)]

- (b) Classify oscillators based on (i) Shape of waveform (ii) Frequency of oscillation. [[CO4](Apply/IOCQ)]

8 + 4 = 12

Group - D

6. (a) Implement a circuit that can perform (i) subtraction (ii) differentiation and derive the input-output relationship. *[[CO5](Analyze/IOCQ)]*
(b) Derive the expression of output voltage for an inverting adder circuit using operational amplifier. *[[CO5](Analyze/IOCQ)]*
(4 + 4) + 4 = 12
7. (a) Explain the basic operation of an half wave Precision rectifier. *[[CO5](Remember/LOCQ)]*
(b) Explain the operation of a Schmitt trigger circuit with the help of a circuit diagram and voltage transfer characteristics. What is hysteresis and how does it help in elimination of noise? *[[CO5](Evaluate/HOCQ)]*
4 + (6 + 2) = 12

Group - E

8. (a) Show that the efficiency of an RC-coupled class-A amplifier can not exceed 25%. *[[CO6](Apply/IOCQ)]*
(b) What is cross over distortion and how it can be overcome? *[[CO6](Remember/LOCQ)]*
7 + 5 = 12
9. (a) Design an automatic smoke alarm system using 555 timer IC. The circuit will be triggered by an external signal initial alarm. The alarm rings for 1 minute and turn off. *[[CO6](Evaluate/HOCQ)]*
(b) Explain the operation of a class-B amplifier and hence prove that the maximum efficiency in class-B configuration can't exceed 78.5%. *[[CO6](Analyze/IOCQ)]*
6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	13.6	58.30	28.1