

Total Pages—6

(Set-Q₁)

B.Tech-1st(ALL)
Basic Electronics

Full Marks : 70

Time : 3 hours

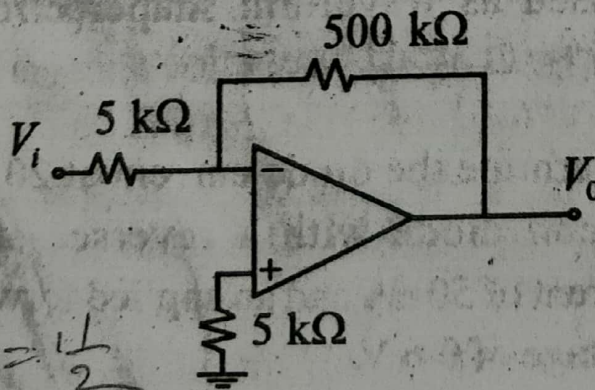
Answer Q. No. 1 which is compulsory and
any five from the rest

The figures in the right-hand margin indicate marks

1. Answer the following questions : 2 × 10

(a) Write down Barkhausen criteria for oscillation
and draw the circuit diagram of collpit
oscillator using BJT with proper labeling.

(b) Calculate the total offset voltage for the
circuit shown below :



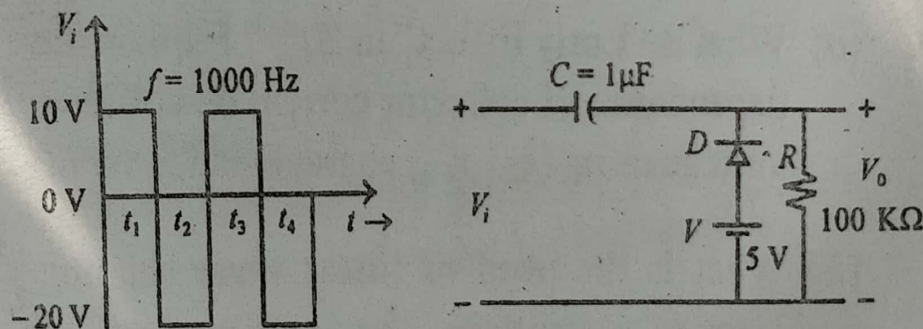
$\text{Dia} = \frac{1}{2}$

(Turn Over)

(5)

and $V_{i2} = 140 \mu\text{V}$. The amplifier has a differential gain of $A_d = 4000$. (Assume that $\text{CMRR} = 10^5$). 5

6. (a) Explain the principle behind the display of waveform in CRO. What are the parameters that can be measured with the help of CRO. 5
- (b) Differentiate between clipper and clamper. Determine the value of output voltage (V_o) for the network shown below : 5



Assume that diode (D) is an ideal diode.

7. (a) Calculate the oscillation frequency for transistor Hartley circuit with the following parameters : 5

$L_1 = 750 \mu\text{H}$, $L_2 = 750 \mu\text{H}$, $M = 150 \mu\text{H}$
and $C = 150 \text{ pF}$

Assume that

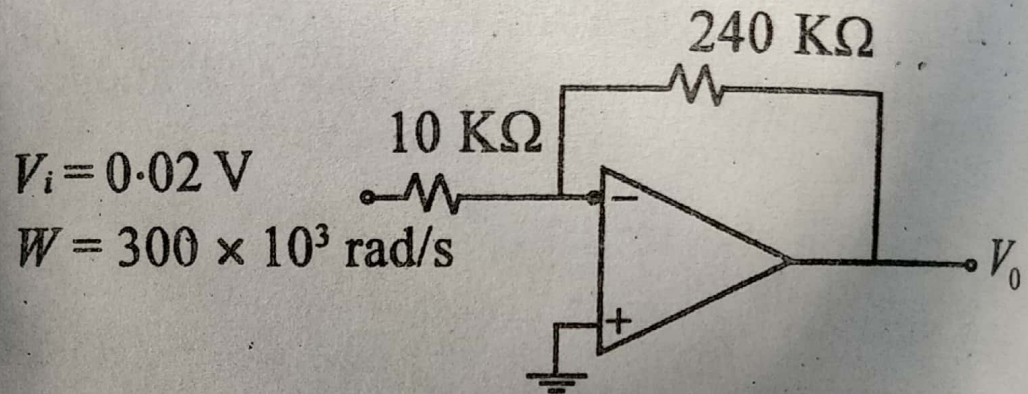
Input offset voltage = 4 mV &

Input offset current = 150 nA

- (c) How AM and FM are used in television system ?
- (d) Define load line in BJT. How Q-point is related to load line ?
- (e) Perform the subtraction of $(358)_{10}$ from $(592)_{10}$ using 9's complement method and compare the result with the result coming out from the direct subtraction of the above two numbers.
- (f) Out of clipper and clamper, which one is used as waveform shaper circuit and why ?
- (g) Determine the diode current at 20°C for a silicon diode with a reverse saturation current of 50 nA and an applied forward bias voltage of 0.6 V.

- (h) If the emitter current of a bipolar junction transistor is 8 mA and the base current is $\frac{1}{100}$ of I_C , then determine the levels of I_C and I_B .
- (i) Define the terms : "frequency spectrum, resistivity, bulk resistance and ohmic resistance". Draw the energy band diagram of extrinsic semiconductor.
- (j) Differentiate between enhancement type MOSFET and depletion type MOSFET and write down Shockley's equation.
2. (a) How JFET has been constructed ? Explain the principle of operation of JFET at different values of V_{GS} and V_{DS} . 5
- (b) Find out the expressions for the rms voltage, dc voltage and peak inverse voltage (PIV) for the full wave bridge rectifier. 5
3. (a) Define slew rate (SR) associated with OPAMP. Using the circuit shown below, determine the maximum signal frequency.

that may be used in an OPAMP with slew rate of $0.5 \text{ V}/\mu\text{s}$.



- (b) Explain the use of BJT as an amplifier with example.
4. (a) Write down the differences between practical OPAMP and ideal OPAMP and do the analysis of OPAMP used as an integrator.
- (b) What is the need of “preset” and “clear” inputs given to a SR-flip-flop. Explain with example.
5. (a) Explain the modulation and demodulation processes in AM and calculate the total power and efficiency.
- (b) Determine the output voltage of an OPAMP for the input voltages of $V_{i1} = 150 \mu\text{V}$