

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) What is Zener breakdown? Give two reasons.

(b) Derive the expression of $I_c V_s I_B$ for a CE transistor configuration.

(c) An Amplifier has a voltage gain of 100 V/V and current gain of 1000 A/A. Express the voltage and current gains in the decibels and find power gain.

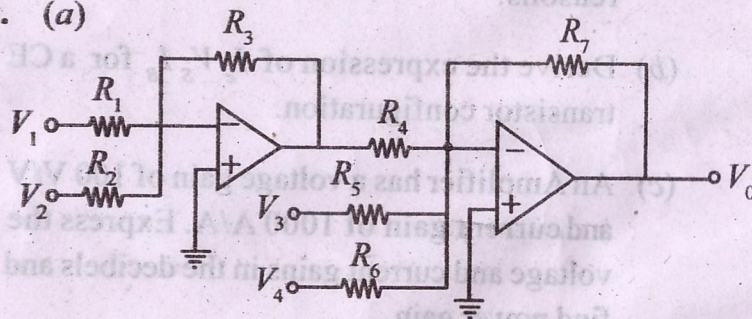
(d) Draw the circuit of an op-amp Integrator.

(Turn Over)

(2)

- (e) Mention the two advantages of negative feedback.
- (f) What is ' α ' and ' β ' of a BJT? Write the relation between them.
- (g) Define 'stability factor' and derive its general expression.
- (h) Why a Time base voltage is generally given to the horizontal plate of CRO?
- (i) What is the needs of modulation?
- (j) Define slew rate of an op-amp. What is its significance?

2. (a)



Find the values of the resistors such that the above circuit provide $V_0 = V_1 + V_2 - 4V_3$. 5

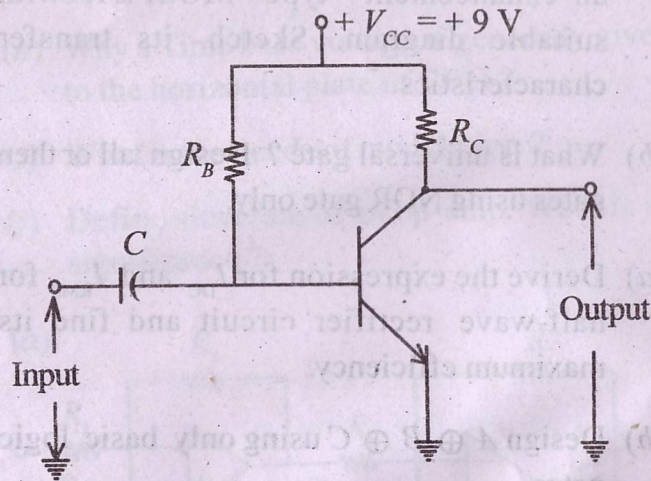
(3)

- (b) What do you mean by clipper? Draw the circuit of a double ended clipper using ideal $p-n$ junction diode, which limits the output from + 3 volts to - 3 volts for a sinusoidal inputs of 'SV' amplitude. 5
3. (a) Describe the principle and operation of an enhancement type MOSFET, with suitable diagram. Sketch its transfer characteristics. 5
- (b) What is universal gate? Design all or then gates using NOR gate only. 5
4. (a) Derive the expression for I_{DC} and I_{RMS} for half-wave rectifier circuit and find its maximum efficiency. 5
- (b) Design $A \oplus B \oplus C$ using only basic logic gates. 5
5. (a) If the gain of an amplifier is 90 dB and 60 dB without and with feedback respectively, then find out the feedback factor of the amplifier. 5

(4)

- (b) Find out the values of R_B and R_C for which the voltage gain (Amplification factor) of the amplifier is expected to be 200. Assume that collector current $I = 2 \text{ mA}$, current gain $\beta = 100$ and the voltage drop across the base emitter junction is 600 mV . (Assume $V_T = 25 \text{ mV}$)

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6. (a) Minimize the given function using K-map and convert the minimised function in POS form.

$$f(A, B, C, D) = \sum (2, 3, 5, 7, 13)$$

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(5)

- (b) Sketch the circuit diagram of a modulo 10 counter. Explain the operation.

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7. (a) What is input impedance of an ideal CRO? Justify. Explain CRO as a voltmeter.

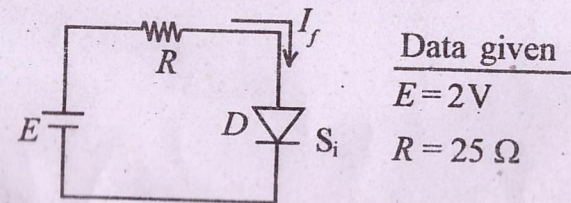
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- (b) Derive the expression for an amplitude modulated signal, if the message signal is represented as $A_m \sin \omega_m t$ and carrier signal is $A_c \sin \omega_c t$.

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8. (a) Calculate forward current I_f for the silicon diode with dynamic resistance $r_d = 0.25 \Omega$ in the following circuit :

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Data given

$$E = 2 \text{ V}$$

$$R = 25 \Omega$$

- (b) With a neat diagram, explain the principle of an oscillator circuit. Derive the frequency of operation of an RC-phase shift oscillator.

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