

B.Tech. 3rd Semester Exam., 2013

BASIC ELECTRONICS

Time : 3 hours

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Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Choose the correct alternative of the following

(any seven) :

2×7=14

- (a) When a step-input is given to an op-amp integrator, the output will be
 - (i) a ramp
 - (ii) a sinusoidal wave
 - (iii) a rectangular wave
 - (iv) a triangular wave with d.c. bias
- (b) In a JFET, at pinch-off voltage applied on the gate
 - (i) the drain current becomes almost zero
 - (ii) the drain current begins to decrease
 - (iii) the drain current is almost at saturation value
 - (iv) the drain to source voltage is close to zero volt

(c) The value of ripple factor of a half-wave rectifier without filter is approximately

- (i) 1.2
- (ii) 0.2
- (iii) 2.2
- (iv) 2.0

(d) In the voltage regulator shown in Fig. 1, if the current through the load decreases

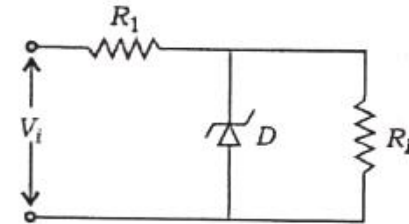


Fig. 1

- (i) the current through R_1 will increase
 - (ii) the current through R_1 will decrease
 - (iii) Zener diode current will increase
 - (iv) Zener diode current will decrease
- (e) The lowest output impedance is obtained in case of BJT amplifiers for
- (i) CB configuration
 - (ii) CE configuration
 - (iii) CC configuration
 - (iv) CE with R_E configuration

- (j) What is the peak current through the resistor in the circuit shown in Fig. 2 assuming the diode to be ideal?

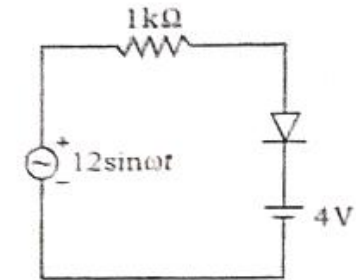


Fig. 2

- (i) 4 mA
(ii) 8 mA
(iii) 12 mA
(iv) 16 mA
2. (a) Explain how the process of avalanche breakdown occurs in a *P-N* junction diode. How is it different from Zener breakdown?
- (b) A silicon diode has a saturation current of $5 \mu\text{A}$ at room temperature of 300 K. Determine its value at 400 K.

3. (a) For the circuit shown in Fig. 3 below :

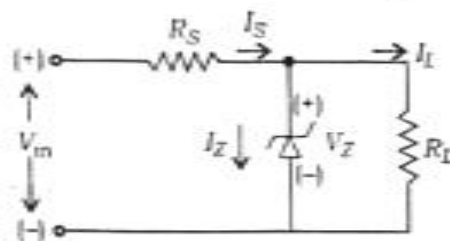


Fig. 3

$$R_S = 20 \Omega, V_Z = 18 \text{ V}, R_L = 200 \Omega$$

if V_{in} can vary from 20 V to 30 V. Find—

- (i) the minimum and maximum currents in Zener diode;
 (ii) the minimum and maximum power dissipated in the diode.
- (b) Draw the voltage doubler circuit. Sketch input and output waveforms and explain the circuit operation. 14
4. (a) A simple full-wave bridge rectifier circuit has an input voltage of 240 V a.c. r.m.s. Assume the diodes to be ideal. Find the output d.c. current, d.c. voltage, r.m.s. values of output currents and voltages. Assume load resistance to be 10 k Ω .
- (b) Explain α and β factors of transistors. Derive the expressions for them and state their meanings. 14

5. (a) In a self-biased CE amplifier, $R_C = 5 \text{ k}\Omega$, $R_2 = 9 \text{ k}\Omega$, $R_1 = 81 \text{ k}\Omega$, $\beta = 50$ and $R_E = 810 \Omega$. Compute the stability factor.

- (b) What is operating point? Explain its physical significance with proper example. 14

6. (a) State the advantages of FET over BJT.

- (b) Derive an expression for the gain of negative voltage feedback amplifier. 14

7. (a) What is clamping circuit? With neat diagram, explain different types of clampers.

- (b) Sketch V_{out} for the network shown in Fig. 4 below :

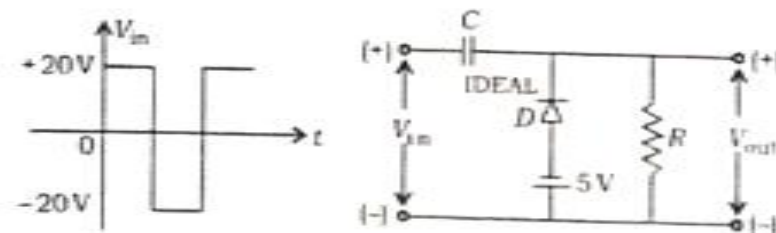


Fig. 4

14

8. (a) Compute the voltage gain and power gain of the amplifier circuit shown in Fig. 5 below :

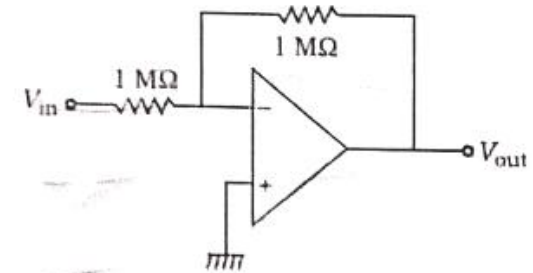


Fig. 5

- (b) Explain the turn-off mechanism of SCR. 14

9. Write short notes on the following : $3\frac{1}{2}\times 4=14$

- (a) UJT
- (b) Pi filter
- (c) Light-emitting diode (LED)
- (d) Integrator
