Code : 041301

B.Tech. 3rd Semester Exam., 2013

BASIC ELECTRONICS

Time : 3 hours | *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

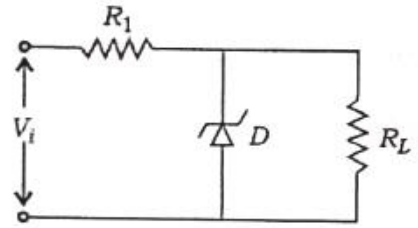

Fig. 1

(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?

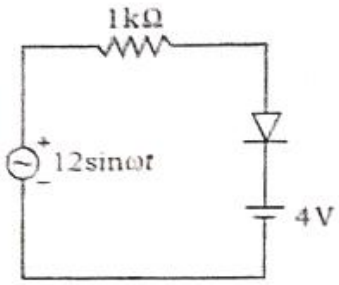

Fig. 2

(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 μA at room temperature of 300 K. Determine its value at 400 K. 14

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

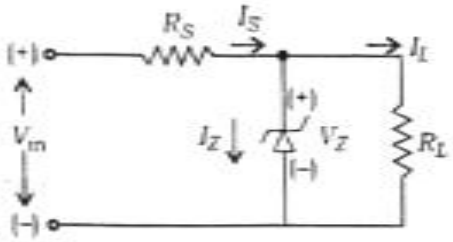

Fig. 3

$R_S = 20\ \Omega$, $V_Z = 18$ 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 kΩ.

(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, $R_C = 5$ kΩ, $R_2 = 9$ kΩ, $R_1 = 81$ kΩ, $\beta = 50$ 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 :

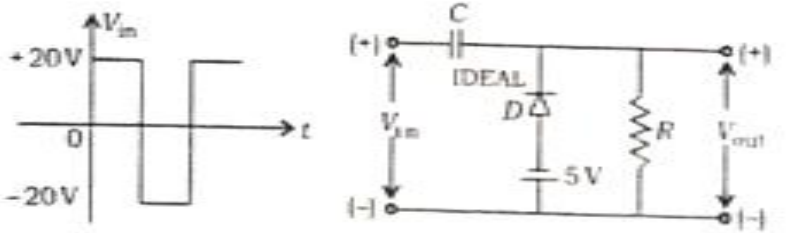

Fig. 4 14

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

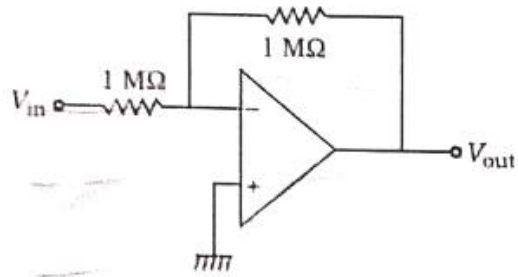

Fig. 5

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

9. Write short notes on the following : 3½×4=14

(a) UJT

(b) Pi filter

(c) Light-emitting diode (LED)

(d) Integrator

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