BACHELOR PRINTING ENGINEERING EXAMINATION, 2017
(1st Year, 2nd Semester)
Electronics

Time : Three hours

Full Marks : 100

Instruction :

1. Answer any *five* questions out of 8 questions.
2. Answers of sub questions of any questions should be written in one place. Do not be haphazard.

1) a) Define mobility and it's SI unit. Why mobility of electron is greater then that of hole in a semiconductor ?

Find Resistivity of an intrinsic Si-bar with following data :

Intrinsic carrier concentration = 1.5×10^3 /cc
Electronic Charge = 1.6×10^{-19}C
Electron Mobility = 1400 cm^2 / V.Sec.
Hole Mobility = 450 cm^2/ V.Sec.

(1+1+3+5 = 10)

b) A Si-diode is applied with a forward bias voltage V. Draw tentative characteristic (FB) curves of it, if it be (1) real diode, (2) approximate model diode (3) ideal model diode. (2x3 = 6)

c) Calculate (with argument) the net voltage and current in the circuit in fig.-I of APPENDIX. (4)

2) a) Define rectification efficiency (η) of a diode rectifier deduce an expression for (η) of a half wave rectifier in terms of circuit parameters and show that its maximum value may be 40.5%.

(2+6+2 = 10)

b) Draw the equivalent circuit of the Si-rectifier given in fig.- II of APPENDIX where $r_f = 10\ \Omega$ and $V_b = 0.7$V Hence calculate peak current in the circuit and peak O/P voltage. What will be these values if the diode be an ideal one.

(2+2x2+2x2 = 10)

3) a) Draw circuit diagram of a bridge-rectifier and briefly explain it action. Also show the nature of O/P voltage if its I/P voltage be sinusoidal.

(2+4+2 = 8)

b) Discuss temperature dependence of characteristic curve of a diode. (6)

c) What is a clipper circuit ? Draw a combination clipper circuit using two real diodes showing the nature of its O/P with a sinusoidal I/P voltage.

(2x3 = 6)

4) a) Why NPN transistor is more useful than PNP ? Draw double diode analogy circuit of a NPN transistor and write down the transistor equations from the circuit. (2x3 = 6)

b) Draw I/P and O/P characteristic curves of a NPN transistor (CE Configuration) and discuss their similarities with diode characteristics. Define I/P and O/P resistance of transistor from these curves.

(2x2+3+2 = 9)

c) Copy fig.- III of APPENDIX and calculate I_B, I_C, I_E and V_{CE} .

(5)

5) Draw a neat diagram of single stage amplifier circuit using a single battery (self bias). Mention the phasal nature of O/P voltages at its two O/P ends. Also briefly discuss the functions of various capacitors present in the circuit. (4+2+3 = 9)

b) Draw the DC and AC equivalent circuits of the above amplifier. (3+3 = 6)

c) Referred to the DC equivalent circuit as above, deduce the equation of DC lode line of the amplifier. (5)

6) a) Define lower cut-off and upper cut-off frequency of an amplifier. Why are they also called 3dB frequencies ? What is dB power gain ? Calculate dB power gain of an amplifier with 59% amplification. (2x2+3+2+2 =11)

b) In an amplifier the max. power gain = 90dB at 2KHz and gain falls to 87dB at 200Hz and 3.5KHz. What is the band width of the amplifier ? Answer with reasons. (2)

c) A Zener diode of unregulated power supply has the following ratings : $V_z = 6.8V$, $r_z = 2(\Omega)$ at $I_z = 50mA$. If maxm. source current = 150mA and load current varies from $I_L(min) = 10mA$ to $I_L(max) = 120mA$, what would be the variation of load voltage and % regulation ? (7)

7) a) Write down fundamental equation of feedback amplifier (No deduction). Hence define positive and negative feedback. Also establish the statement – "Negative Feedback improves bandwidth at the cost of gain". (1+2+3 = 6)

b) From fundamental equation of feedback show that % variation of gain with feedback is less than the same without feedback if the feedback be negative. (7)

c) An amplifier has a open loop gain = 400 and negative feedback = 10%. It open loop gain changes by 20%, find the % change in closed loop gain and sacrifice factor (7)

8) a) Why an OPAMP is named as OPAMP ? Mention 4 special features of an ideal OPAMP . (2+4 = 6)

b) Discuss the functions of two I/P ideal OPAMP as :

1) Inverting amplifier and unit inverter (3+1 = 4)
2) Voltage Subtractor (5)
3) Inverting Summing Amplifier (5)

APPENDIX
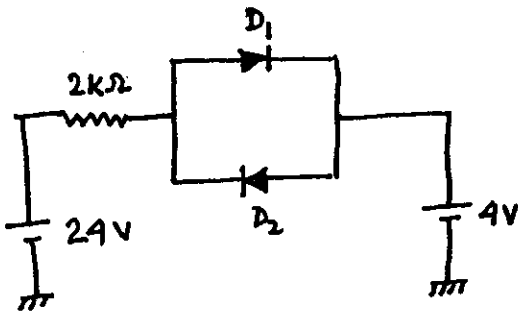
D_1 - D_2 are Si Diodes
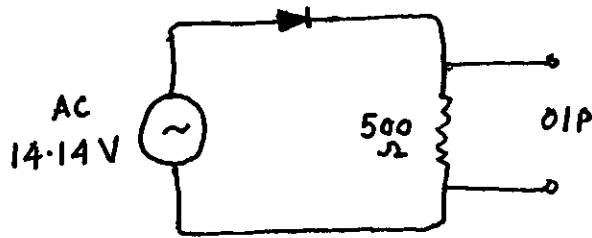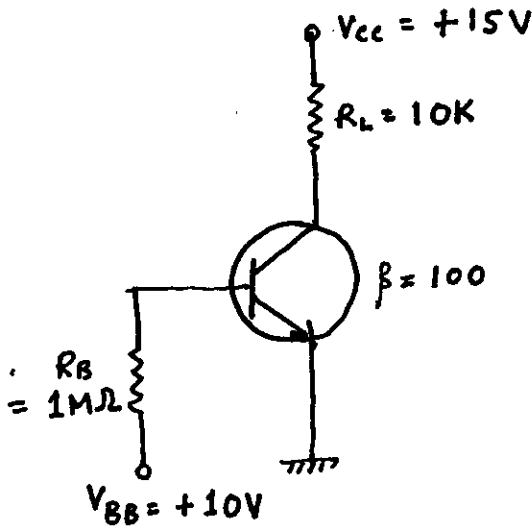r_f negligible. $V_t = 0.7V$.

Fig-I

Fig-II

V_{BE} negligible

Fig - III .