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RN-8069

B. E. II (Sem. III) (ECC/CO/EL/IT/IC) Examination

May / June – 2010

Basic Electronics

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. 2 (Sem. 3) (ECC/CO/EL/IT/IC)**

Name of the Subject :

☛ **Basic Electronics**

☛ Subject Code No. : **8 0 6 9** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Attempt **all** questions.
(3) Assume suitable data whenever **necessary**.
(4) Figures to the **right** indicate full marks.

1 (a) Answer the following questions : **10**

(i) Define : Electric field intensity.
(ii) The free electron is said to be in the _____ band.
(iii) Define : Carrier life time.
(iv) State mass action law.
(v) The _____ current flows due to a non-uniform concentration gradient.
(vi) In the intrinsic semiconductor n = p = _____
(vii) The capacitance of a reversed biased p-n junction is _____.
(viii) The _____ diode shows a negative resistance region in its characteristic.
(ix) The relation between I_{CEO} and I_{CBO} is _____.
(x) Name the three operating region of the transistor.

(b) (i) Explain transistor current components. **4**

(ii) A bar of n-type Si has length of 4 cm and circular cross section of $10mm^2$. When it is subjected to a voltage of 1V applied across its length, the current flowing through it is 5mA. **6**

Calculate :

(a) Concentration of free electrons.
(b) Drift velocity of electrons.

Assume : Charge on one electron as 1.6×10^{-19} C.
Mobility of free electrons as 1300 $cm^2/V.S$.

2 (a) Expalin the generation and recombination of charges. 8

(b) For a diode circuit shown in figure 1 show that : 7
$V_o = 0.98\ V_1 + 0.01\ V_2 - 0.59$ For the diode, cut-in voltage is 0.6 V and forward resistance of 20 Ω.

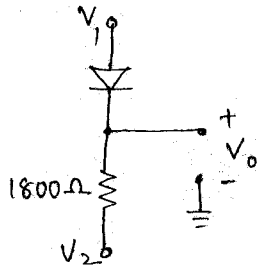

Fig. 1

OR

(b) A bridge rectifier circuit has secondary voltage of 12V. Assume secondary resistance and diode forward resistance to be negligible. Load resistance is 100 Ω. Calculate peak load current, DC load current, RMS load current and P/V across each diode. 7

3 Write short notes : (any **three**) 15
(a) Base Width Modulation
(b) Zener diode as a voltage regulator.
(c) Operation of p-n-p transistor in the Active Region.,
(d) Tunnel diode
(e) Rectifier with different filter circuit.

4 (a) Attempt the following : 10
(i) High quality audio amplifier having maximum acceptable hurmonic distortion is _____.
(ii) In _____ distortion differnt frequency signals are amplified by different amount.
(iii) _____ amplifier causes minimum drain on power supply.
(iv) A particular transistor has hfb = –0.98. Its hfe is _____.
(v) In class A amplifier utilizing a direct coupled load (resistive), the maximum efficiency is _____.
(vi) Cross-over distortion in class-B push-pull amplifier can be overcome by_____.
(vii) Gate-Drain transfer capacitance of MOSFET has large value in _____ region and small value in _____ region.
(viii) When reverse gate voltage of 12 volt is applied to JFET, the gate current is 1nA. Determine the resistance between Gate and Source.
(ix) Entrance type MOSFET are normally _____ device while deplation type MOSFET are normally _____ device.

(x) True or False :
FET may be used as both analogue and logical switches.

(b) Determine, I_B, I_C, V_{CE}, V_C, V_E, V_B, V_{BC} for the following figure. **5**

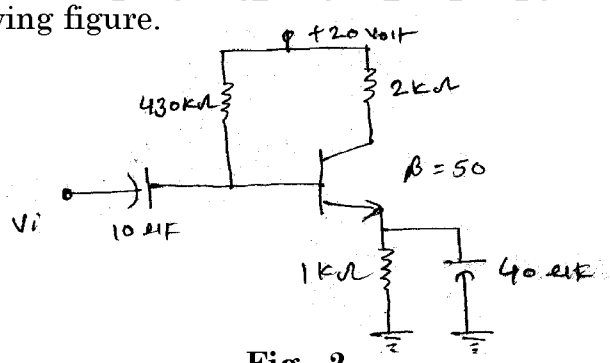

Fig. 2

(c) Given that I_{CQ} = 2 mA and V_{CEQ} = 10 volt. Determine R_1 and R_c for the following network. **5**

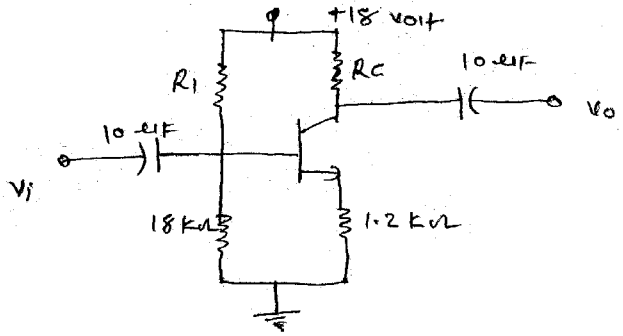

Fig. 3

5 (a) Derive equation for Z_i, Z_b, Z_o, A_v, A_i of simplified CC hybrid model. **7**

(b) For class-B amplifier providing a 20 volt peak signal to 16 Ω load (speaker) and a power supply of V_{CC}=30 volt, determine the i/p power, o/p power and circuit efficiency. **4**

(c) For the voltage divider bias configuration of following fig. if V_D = 12 volt and V_{GSQ} = -2 volt determine value of R_s. **4**

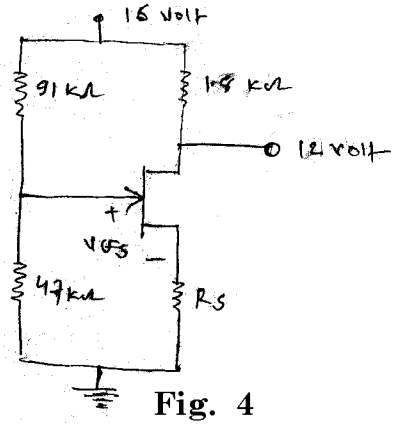

Fig. 4

OR

5 (a) A dc analysis of the source follower network of following Fig. will result in $V_{GSQ} = -2.86$ volt and $I_{DQ} = 4.56$ mA. 7
Determine gm, rd, zi
Determine A_v with and without rd. Compare result.
Calculate Z_o with and without rd. Compare result.

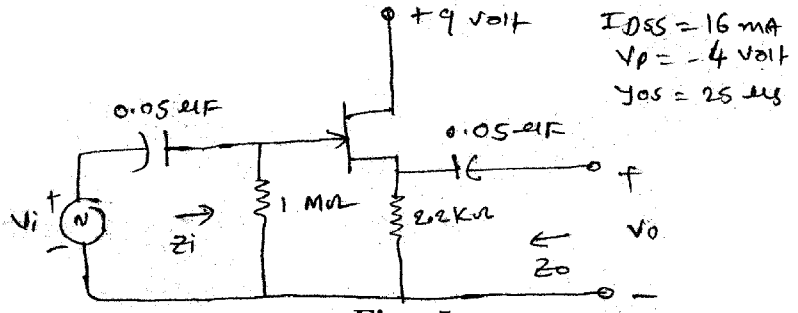

Fig. 5

(b) For the following figure calculate maximum i/p power, o/p power, i/p voltage for maximum power operation and power dissipated by the o/p transistors at this voltage. 4

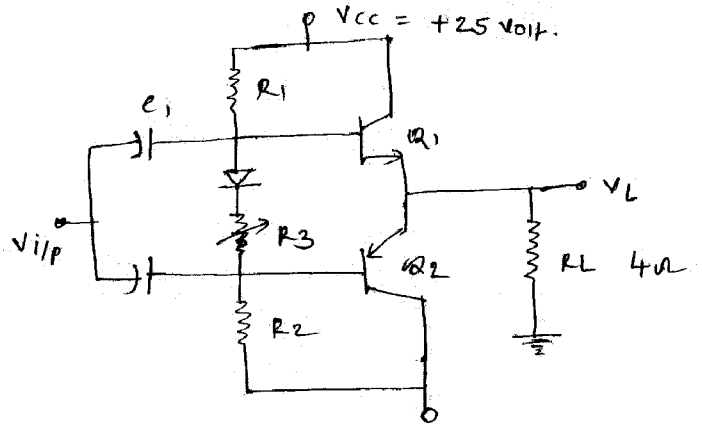

Fig. 6 $-V_{EE} = -25$ volt

(c) Calculate harmonic distortion component for an o/p signal having fundamental amplitude of 2.5 volt, second harmonic amplitude of 0.25 volt, third harmonic amplitude of 0.1 volt and fourth harmonic amplitude of 0.05 volt. 4

6 Attempt following (any **three**) 15

(a) Explain construction, working and characteristics of n-channel enhancement type MOSFET.

(b) For the JFET fixed biased configuration derive equation for Zi, Zo, Av with necessary diagram.

(c) Explain class-B amplifier in brief.

(d) Write short note on transistorized series voltage regulator.