Seat No. | | | | | | |

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मधुर - 001

Solid State Devices and Circuits - I
(143101/183101/233101)

P. Pages : 4

Time : Three Hours **Max. Marks : 80**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Answer **any two** subquestions from each question.
5. Assume suitable data if necessary.
6. Use of non programmable calculator is allowed.

UNIT - I

1. a) Explain static and dynamic resistance of diode and Derive the expression for the dynamic resistance. **8**

b) A sample of germanium is doped to the extent of 10^{14} donor atom/cm^3 and 7×10^{13} acceptor atom/cm^3. At the temperature of sample the conductivity of pure germanium is $0.01666\,(\Omega\,cm)^{-1}$. If applied field is 2 v/m. Find the total conduction current density.

Assume $\mu_p = 1800\ cm^2/v-sec$, $\mu_n = 3800\ cm^2/v-sec$. **8**

c) Write a note on : **8**

i) Full wave rectifier with capacitor filter.

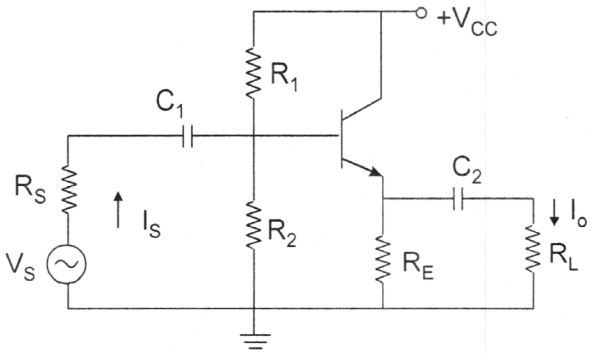
ii) Efficiency, Ripple factor, P|V and TUF of H/w rectifier.

UNIT - II

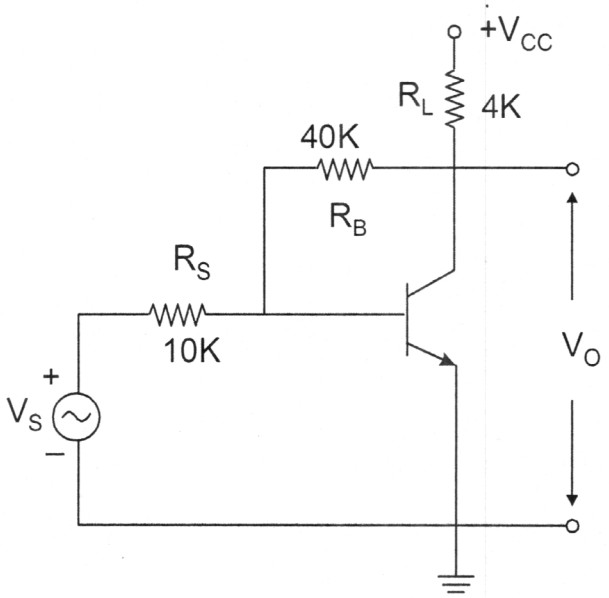
2. a) Explain voltage divider baising in detail. Also derive the equation for Q point values of stability factor. **8**

b) A common collector circuit as shown in fig. has the following components $R_1 = 27k\Omega, R_2 = 27k\Omega, R_E = 5.6k\Omega, R_L = 47k\Omega, R_S = 600\Omega$. The transistor parameters are $h_{ie} = 1k\Omega, h_{fe} = 85, h_{oe} = 2\mu A/v$. Calculate

$A_i, R_i, A_v, R_o, A_{rs} = \frac{V_o}{V_i}$ and $A_{is} = \frac{I_o}{I_S}$ **8**



c) For the circuit shown in fig. Calculate $R_i, R_{is}, A_v, A_{VS}, A_i, R_o, R_{os}$.
The transistor parameters are $h_{ie} = 1.1k, h_{fe} = 50, h_{oe} = 0$ and $h_{re} = 0$ **8**



UNIT - III

3. a) Explain operation of P-channel JFET with neat diagram. Also draw the drain characteristics curves. **8**

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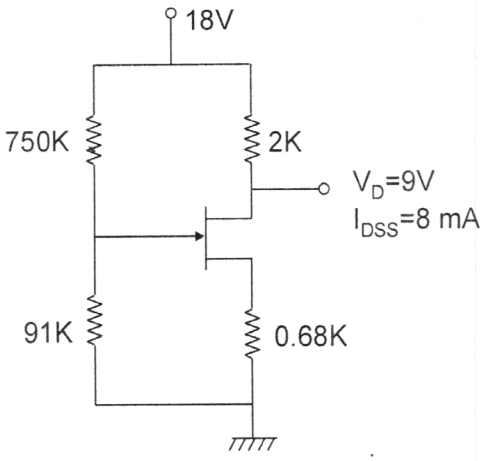
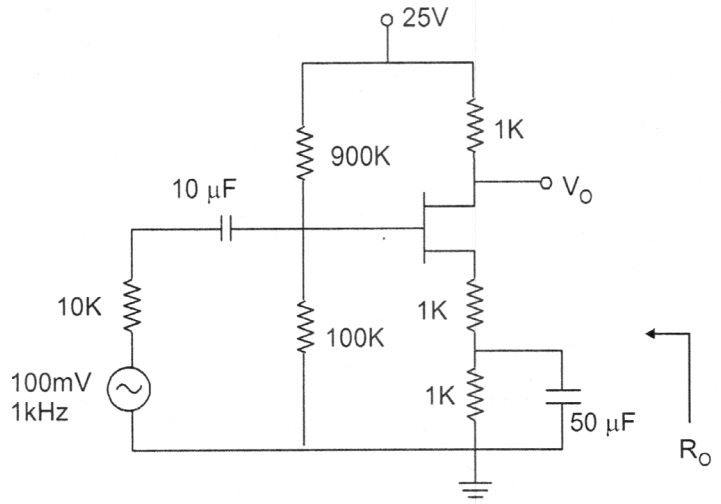
b) For the network given in fig. $V_D = 9\,V$. Determine I_D, V_S, V_{DS}, V_G, V_{GS} and V_P. **8**



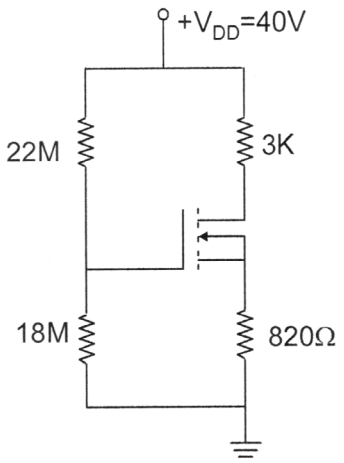
c) For the circuit shown in fig. determine the o/p voltage and o/p resistance. Assume $g_m = 5mA/v$, $r_d = 10k\Omega$. **8**



UNIT - IV

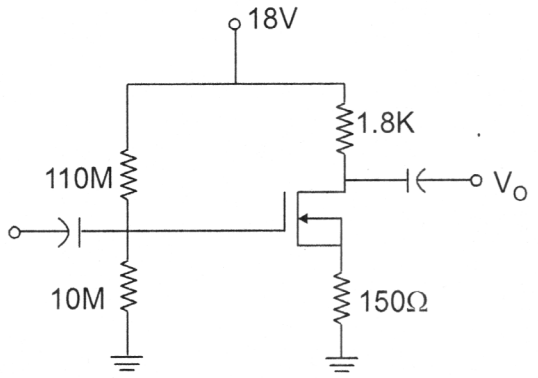
4. a) Explain the construction and operation of n-channel enhancement type MOSFET. **8**

b) Calculate V_G, I_D, V_{GS} and V_{DS} for the circuit shown in fig. **8**



$V_{GS(Th)}$= 5V
$I_{D(ON)}$= 3 mA
at $V_{GS(ON)}$ = 10 V

c) For the circuit shown in fig. resulting in $V_{GSQ} = 0.35\,V$ and $I_{DQ} = 7.6\,mA$.
Determine (i) gm and gm_o (ii) find r_d (iii) Z_i, Z_o (iv) A_v **8**



I_{DSS} = 6mA
V_P = – 3V
y_{OS} = 10 μS

UNIT - V

5. a) Derive an expression for F_L and F_H of square wave testing of an amplifier. **8**

b) Explain the necessity of multistage amplifier. A multistage amplifier is to be constructed using 4 identical stages each of which has a lower cut off frequency 15 Hz and upper cut off frequency 30 kHz.
What will be the F_L and F_H of the multistage amplifier. If the midband gain of each stage is 8.2, what will be approximate gain of the multistage amplifier at 7.5 Hz and at 300 kHz. **8**

c) Explain the effect of coupling, bypass capacitor and junction capacitor on frequency response of BJT. **8**

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