Midterm Evaluation Scheme

Basic Electronics (ECE-1071) Semester: I Date: 24/09/2024 MARKS:30

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1. $\frac{Io(Ge)}{Io(si)} = \frac{(e^{VSi/\eta VT})-1}{(e^{VGe/\eta VT})-1} = \frac{(e^{0.718/2\times26\times10^{-3}})-1}{(e^{0.1435/1\times26\times10^{-3}})-1} = 4\times10^{3}$
2. $V_m = \sqrt{2}\times200 = 282.84,\ V_{dc} = \frac{2V_m}{\pi} = 180.063, I_{dc} = \frac{V_{dc}}{R_L} = 0.18\ A$
3. Either of the two options mentioned in (a) and (b)
4. Cut-off region
5. $A_{CL} = \left[1+\frac{R_f}{R_i}\right] = 2$
6. Derivation- All terms like V, C_{ox}, E L, V(x) etc. need to be explained with/without diagram. All steps to be mentioned. ……2M

$$I_D = \frac{1}{2}\mu_n C_{ox}\frac{W}{L}\left[2(V_{GS}-V_{TH})V_{DS}-V_{DS}^2\right].$$

a) V_{DS}=0.8V, $V_{GS}-V_{th}$=3.0−1.0=2.0V

$$I_{D,lin} = \frac{\mu_p\cdot C_{ox}}{2}\cdot\frac{W}{L}\cdot[2\cdot(V_{GS}-V_T)V_{DS}-V_{DS}^2]$$

I_D = 384μA 1M

b) Since V_{DS}= 0.8 V<2.0 … the MOSFET is in the triode region -1M

7. Breakdown Phenomenon: Avalanche & Zener breakdown – 2M

   Effect of Temperature – 1 M

8. V_d = 0.693 - 3M
9.

$$\gamma = \frac{Vr_{rms}}{V_{dc}} = \frac{1}{2\sqrt{3}fCR_L}$$

Ripple factor=0.0103

$$V_{dc} = \frac{2fCR_L}{1+2fCR_L}V_m$$ = 19.65 V (1 M)

Circuit Diagram (1M)

10. Izmax =20mA ----0.5M

Is =40mA ---0.5 M

I_{Lmin} =20 mA and I_{Lmax} =39 mA ---1M

R_{Lmin} =256.41 Ω and R_{Lmax} = 500 Ω ---1M

11. $V_o = A_d V_d + A_c V_{cm}$: V_d = 5mV; A_d =1246; V_{cm}=1mV; A_{cm} = 12; CMRR=103.8333; CMRR in dB=40.3267dB

12. V_m=31.11V

I_m=62.22mA ------- 1/2M

I_{dc}= 39.61mA ------- 1/2M

I_{rms}= 43.99mA ------- 1/2M

PIV>62.22V ------- 1/2M

13. Circuit diagram ------- 1/2M

Working ------- 1/2M

I_{dc} ------- 1/2M

I_{rms} ------- 1/2M

14. Derivation for V_{out} - 1.5 Marks

Output Voltage = 10V – 0.5Mark