INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
ELECTRICAL ENGINEERING DEPARTMENT

Marking Key for EE-Quiz-1
MS-101 Makerspace, 2023 Spring semester

To be used in conjunction with solution to Quiz-1

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1. All numerical answers should be accompanied by computations steps.

2. Details in these steps may vary, but you should be convinced that the reported answer was obtained from these computations. See the solution printout for possible computation steps.

3. Give half credit for answers with correct magnitude but wrong sign.

Q–1   a) $\boxed{24 \text{ V}}$ – [1 mark]

   b) $\boxed{21.82 \text{ V}}$ – [1 mark in range 21.5 to 22.0]

   c) $\boxed{4.76 \text{ W}}$ – [1 mark in range 4.6 to 4.9]

   – [Q1: $1 \times 3 = 3$ marks]

Q–2 $\boxed{R_L = 90 \text{ k}\Omega}$ No partial marks.   – [Q2: 2 marks]

Q–3 Half marks for steps, half for numerical values.

   a) Currents in mA:

i_1	i_2	i_3	i_4
150	150	-350	-350

   – [$(0.5 + 0.5) \times 4 = 4$]

   b) Voltages at A, B, C:

V(A)	V(B)	V(C)
5.5	2.5	13

   – [$(0.5 + 0.5) \times 3 = 3$]

   – [Q3: $4 + 3 = 7$ marks]

14.40

Q–4 $I_d = 14.46$ mA   Range: ~~14.45~~ to 14.50 mA.

   – [Q4: 1 mark for equation and steps, 1 for value. Total 2 marks]

Q–5 For all parts: 0 marks without steps, 1 for correct steps/wrong values,
   2 marks if steps as well values are correct.

   a) Answer: $\boxed{v_{DM} = -128.2 \text{ mV}}$ Range: -125 to -130 mV – [1+1 marks]

   b) Answer: $\boxed{v_{CM} = 5.0641 \text{ V}}$ Range: 5 - 5.1 V   – [1+1 marks]

   c) Answer: $\boxed{v_{out} \approx -2.5 \text{ V}}$ Range: -2.50 to -2.55 V   – [1+1 marks]

   – [Q5: $2 + 2 + 2 = 6$ marks]

Q–6 a) Voltage gain $= 1.5$ No partial marks   – [1.5 marks]

     b) Current gain $= 1500$ – [2 marks]

             – [1 mark to be given if steps are right but value is wrong.]

     c) Power gain $= 2250$ No partial marks   – [1.5 marks]

             – [Q6: $1.5 + 2 + 1.5 = 5$ marks]

Q–7 a) **For all parts, 50% marks for steps, 50% for numerical values with the correct sign.**

       Answer: $\boxed{V_{\text{DUT}} = 4.5 \text{ V}}$ – [0.5 + 0.5 = 1 mark]

                 $\boxed{V_{\text{Out}} = -3 \text{ V}}$ – [0.5 + 0.5 = 1 mark]

     b) Answer: $\boxed{V_{\text{DUT}} = -7 \text{ V}}$ – [1 + 1 = 2 marks]

                 $\boxed{I_{\text{DUT}} = -2 \text{ mA}}$ – [0.5 + 0.5 = 1 mark]

             – [Q7: $= 2 + 3 = 5$ marks]