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Daffodil International University

Department of Electrical and Electronic Engineering

Faculty of Engineering

Final Examination, Summer – 2026

Course Code: 0714-211 | Course Title: Electronics I | Teacher's Initial: SD, KNA, KAH, MH

Section: A, B, C, D, E, F, G | Level-Term: L2-T1 | Time: 2.0 Hours

Full Marks: 40 | Exam Date: August 27, 2025

[Q1 and Q2 are mandatory; Answer any three (03) from questions Q3, Q4, Q5, Q6.]

[The second right most column indicates the COs with respective Bloom's level.]

[The right most column indicates the assigned marks.]

[All the symbols carry their usual meaning.]

Q1. (a) **Write** the names of BJT modes of operation and **mention** the biasing conditions of the junctions for each of the operating modes. CO1, C1 [2]

(b) For a BJT, **show** that $\beta = \frac{\alpha}{1-\alpha}$. CO1, C2 [2]

(c) **Explain** the operation of an n-channel MOSFET with necessary diagrams. CO1, C2 [4]

Q2. For the circuit of Fig. Q2, (i) **Calculate** the value of R_C if the collector voltage is 3.4V at dc operating point, (ii) **Draw** the small signal equivalent circuit, (iii) **Derive** the expressions and **find** values for Z_i, Z_o and A_v. CO2, C3 [8]

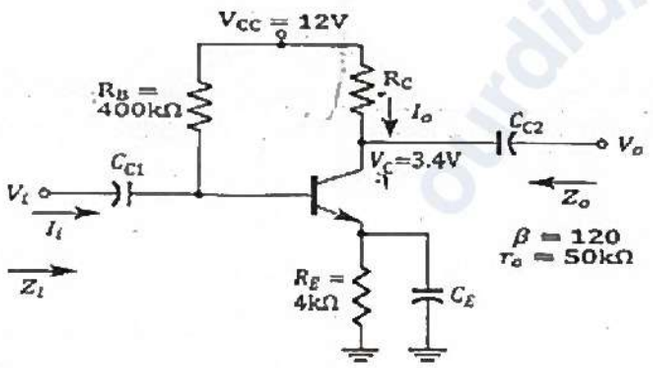


Fig. Q2

Q3. Given that V_B=4V for the following circuit of Fig. Q3, **determine** (i) V_E, (ii) V_C, (iii) β. CO2, C3 [8]

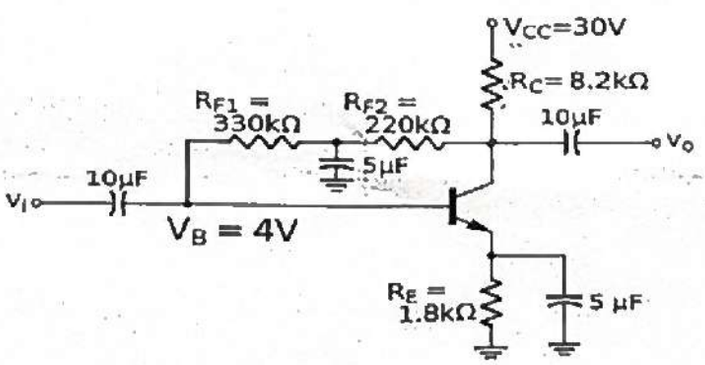


Fig. Q3

-12 -6

11

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Q4. Given the device characteristics in Fig. Q4(b), **determine** R_1, R_2, R_C and $I_{C_{sat}}$ for the circuit in Fig Q4(a). Assume $\beta = 150$. CO2, C3 [8]

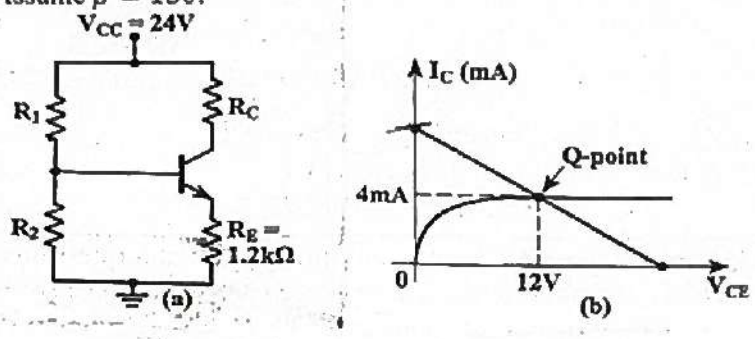


Fig. Q4

Q5. It is required to design the following circuit for biasing a MOS Amplifier. The design requirements are $V_{DD} = 5\,V, I_D = 0.32mA, V_S = 1.6\,V, V_D = 3.4\,V$ with a $1\mu A$ current through R_{G1} and R_{G2}. Assume $V_t = 1\,V$ and $k_n' \frac{W}{L} = 1\ mA/V^2$. **Determine** the values of all the resistances in the circuit. CO2, C3 [8]

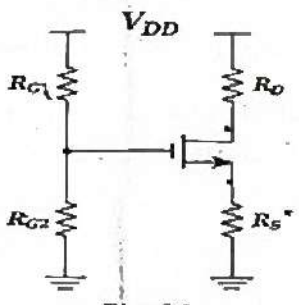


Fig. Q5

Q6. (a) **Draw** the small-signal ac equivalent circuit for the following Common-Source (CS) amplifier. CO2, C2 [4]

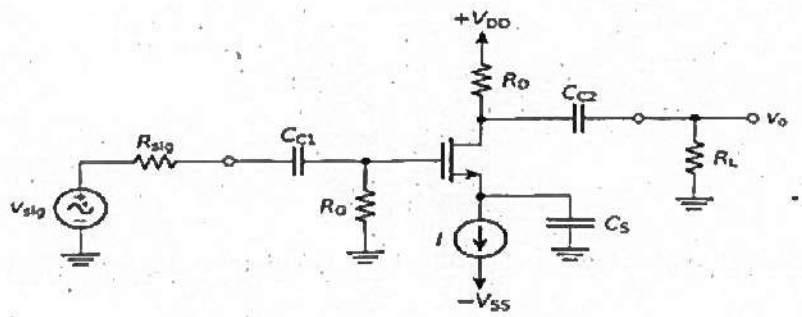


Fig. Q6 (a)

(b) The MOSFET in the following circuit of Fig. Q6(b) has $V_t = 1V$, $k_n' \frac{W}{L} = 0.4mA/V^2$ and $\lambda = 0$. **Determine** the drain voltage. CO2, C3 [4]

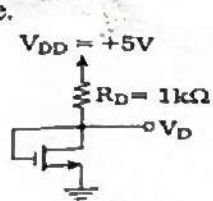


Fig. Q6(b)