Paper 3 - SECTION A

1 (b) I_N = 100 mA; V_{Th} = 0.4 V; R_{Th} = R_N = 4 ohms

(c) 0.48 V

(d) 0.43 V

2 (b) R_2 = **2 kΩ;** R_1 = **8 kΩ.**

(c) R_{in} = **10 MΩ;** R_{out} = **6.06 kΩ;** Small signal voltage gain = **-60.6**

(d) **99 nF**.

(e) **6.06 kΩ**

3 (a) **1.41 mA ∠ 45°.**

(b) **1.55 nF**.

4 (b) 50

5 (a) **1.085 kW**.

(b) **694 W**; **830 μF**.

Part 1A Section B Answers

6 (**short**)
(a) 900ohms - 1 kohms.

7 (short)
(b) 2 gates.

8 (short)
(a) 17 lines
(b) 8 Chips

9 (**long**)
(b) Four states. 2 bistables.
$J_a = Q_b$, $K_a = \overline{B}Q_b$, $J_b = Q_a + B$, $K_b = 1$

Engineering Tripos Part IA 2018
Paper 3: Electrical & Information Engineering
Section C
Numerical Answers

Q10 (short)

240 V/m

Q11 (short)

(a) Flux density always points in the circumferential direction and at any given radius has constant magnitude. With current flowing out of the paper, the flux density is anticlockwise. Thus, flux density vectors form circles. No flux outside the outer conductor, since net current is zero.

(b) 1.5mm: $2 \cdot 10^{-4}$ T
2.5mm: $1.2 \cdot 10^{-4}$ T
4mm: 0

Q12(long)

(a) 0.628T

(b) 70.61 N

(c) 0.0123 T