PART 1A

2011 Paper 3 SECTION A

2 (a) $R_2 = 2k\Omega$

$V_{DD} = 37V$

(b) Input impedance = 1MΩ
Output impedance = 11.1kΩ
Gain=-111.1

(c) $R_{LOAD} = 11.1k\Omega$

(d) $C = 36nF$

3 (a) $P_{LINE} = 2355W$

$V = 251.2V$

(b) P_{Line}= 1.701 kW

4 (b) $R_o = 1352\Omega$

$X_0 = 457.5\Omega$

Turns Ratio=2

$R_t = 1.39\Omega$

$X_t = 8.21\Omega$

5 (a) $V_{Th} = V_{OC} = \frac{R_2}{R_1 + R_2} V$

$R_{Th} = \frac{R_1 R_2}{R_1 + R_2}$

(b) $\bar{I} = 20.26\angle 80.25A$

$\hat{I}_C = 28.65A$

PART 1A
Short Answers Paper 3 – 2011

Section B

6. a) $F=B.\overline{C}.\overline{D} + A.D + \overline{B}.D$

c) $F=B.\overline{C}.\overline{D} + A.D + \overline{B}.D + A.B.\overline{C}$

7. a) 2 bistables

c) $J_A = \overline{Q_B}$, $J_B = 1$, $K_A = \overline{Q_B}$, $K_B = 1$

8 a) i) 00, 7F, 1, 1, 1

ii) FF, 7F, 0, 0, 0

b) 900 ns

9 a)

"Z"↓"0" " = " "Y"↓"0" "," "Z"↓"1" " = " "X"↓"0" "." ¯("Y"↓"1") " + " ¯("X"↓"0") "." "Y"↓"1" "," "Z"↓"

b) $Z_2 = (X_1 + X_0).(X_1 + Y_1).(\overline{X_1} + \overline{X_0} + \overline{Y_1})$

c)

"Z"↓"0" " = " "Y"↓"0" "," "Z"↓"1" " = " ¯(¯("Y"↓"0" "." ¯("Y"↓"1")) "." ¯(¯("X"↓"0") "." "Y"↓"1")) ","

Section C

10 b) 0.031 m

11 a) 3.14 T

b) 1.3 T

12 a) i) $\frac{2}{3}\pi\rho_0 R^3$

ii) $\rho_0 R^3 / 6\varepsilon_0 r^2$, $\rho_0 / \varepsilon_0 \varepsilon_r \left(\frac{1}{3} + \frac{r}{6R}\right) r$

b) i) 1.4 pF

ii) 0.31 nC