GENERAL CERTIFICATE OF EDUCATION BOARD
Technical and Vocational Education Examination

JUNE 2025   **INTERMEDIATE LEVEL**

Specialty code	ELECTRICAL POWER SYSTEMS – EPS
Subject Title	Electrical and Electronic Circuits
Subject Code No.	5240
Paper No.	2

Duration: Three Hours

INSTRUCTIONS TO CANDIDATES

This Paper has TWO Sections

Section A: Answer Any TWO Questions.

Section B: Answer Any TWO Questions.

Weighting of this paper is 35 percent of the whole subject.

Show all steps in your calculations giving your answer at each stage and indicating the units and symbols used.

All sketches must be neat and clear.

You are allowed to use non-programmable calculators and mathematical sets

You are reminded of the necessity for good English and orderly presentation in your answers.
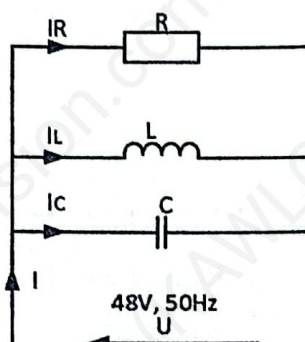
Turn Over

SECTION A
ELECTRICAL CIRCUITS

1.

FIG. 1

Figure 1 shows an R LC parallel circuit. Given that $R = 25\Omega$, $L = 0.12H$ and $C = 120\mu F$.

Calculate:

a) the inductive and capacitive reactance X_L and X_C . (4 marks)

b) the branch currents (I_R, I_L and I_C) . (6 marks)

c) the supply current. (4 marks)

d) the circuit impedance. (4 marks)

e) the power factor of the circuit and say whether it is leading or lagging. (4 marks)

f) the Q – factor. (4 marks)

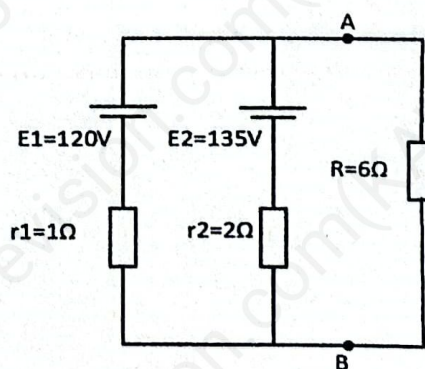g) the resonance frequency of the circuit. (4 marks)

2.

FIG. 2

Using Thevenin theorem in figure 2:

a) Calculate the Thevenin resistance R_{TH} seen from point AB if R is considered as the load (6 marks)

b) Calculate the Thevenin voltage V_{TH} seen from point AB if R is considered as the load (5 marks)

c) Draw the Thevenin equivalent circuit indicating the V_{TH} and R_{TH} (6 marks)

d) Determine the current passing through the resistance R (4 marks)

e) Calculate the voltage between A and B (5 marks)

f) What will be the value of R for maximum power transfer (4 marks)

Go on to the next page

3.

a)

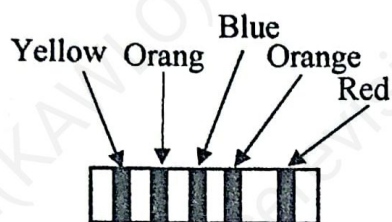
Figure 1

FIG. 3

Determine the resistance of the resistor represented in figure (5 marks)

b) The resistivity of copper at 0°C is $1.57 \times 10^{-8}\,\Omega m$. Calculate the resistivity at 50°C given that the temperature coefficient of copper is 0.0043 (5 marks)

c) Calculate the resistance of a 1000m copper conductor having a diameter of 2mm (5 marks)

d) A coil of 10Ω, 0.85H is connected in series with a capacitor of 1.33μ.
Calculate at resonance:

i. the pulsation (ω: $in\ rad/sec$) (5 marks)

ii. The quality factor Q (5 marks)

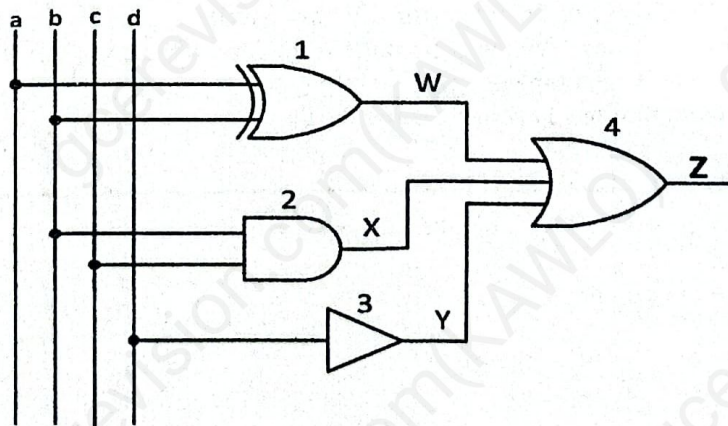iii. The frequency (5 marks)

ECTION B: ELECTRONIC CIRCUITS

FIG. 4

With reference to the logic diagram in figure 4

a) What is the name of the logic gates 1, 2, 3 and 4? (4 marks)

b) Write out the equations W, X, Y corresponding to the outputs of gates 1, 2, 3 and 4 respectively. (6 marks)

c) Draw the truth table indicating W, X and Y. (6 marks)

d) Given the logic equation $L = \bar{a}b + a\bar{b} + bc + d$.

i) Establish the truth table of L. (2 marks)

ii) Represent the equation L in a Karnaugh map (2 marks)

4. Perform the following mathematical operations in binary
    a) Subtraction   **(8 marks)**
       i) $1101 - 1011$
       ii) $111 - 101$
       iii) $100 - 11$
       iv) $1110 - 101$
    b) Addition
    $110011 + 101101$ **(2 marks)**
    c) Conversion from octal to binary   **(5 marks)**
       i) 75_8
       ii) 57_8
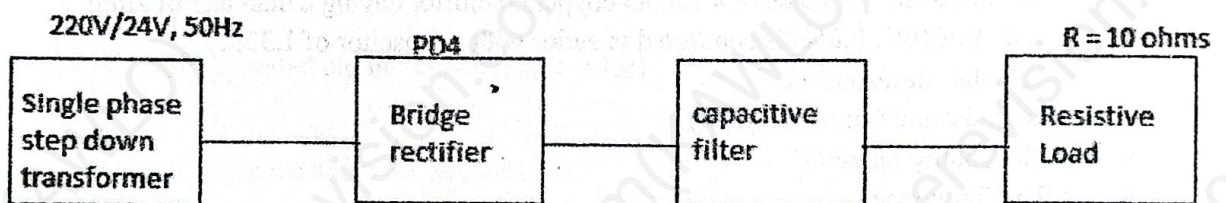   d) Conversion from Decimal to binary   **(5 marks)**

5.

FIG. 5

Figure 5 shows the block diagram of a single phase bridge rectifier supplied from a sinusoidal main supplying a 10Ω resistive load.
a) Draw the circuit diagram.   **(5 marks)**
b) Is the rectifier half wave or full wave? Justify your answer.   **(3 marks)**
c) Draw the waveforms of the voltage across the secondary of the transformer (Vs), the Load (VR) and any diode (VD) for one complete cycle.   **(9 marks)**
d) Give the expression of the dc voltage across the load.   **(3 marks)**