National University
Science & Technology

كليـة عمـان البحـريـة الـدوليـة
International Maritime College Oman

Final Exam
TBEEE: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
Spring 2025

Points of attention:

- o   For each question, the maximum earned points are specified in the question.
- o   Write clearly! Answers that are not readable are not marked and don't earn marks!
- o   All answers should be written in English using **blue or black pens** only.
- o   Use the pencil only for diagrams and graphs.
- o   Show all the calculation steps in the given space.
- o   When finished, submit the question paper, together with the answer scripts and the signed cover page to the invigilator.
- o   Any cheating/copying may result in an instant failing of the examination.

Exam Duration: 2 hours	**40**
Instructor's Name: RANJIT V	
Exam Date: 15/6/2025	**10**
Program: PE	

Student Information

Name: _____   ID: _____

Signature: _____

Invigilator

Initials: _____   ☐ Student ID checked

Time received: _____

**Question 1**   **[6 marks]**

MCQ questions – Each question carries one mark.

a) A transformer is connected to the output of an AC generator in the power station
    for long distance power transmission to transmit power at

     i   low voltage and high current   ii   high voltage and low current

     iii   high voltage and high current

                                            iv   low voltage and low current

b) The voltage-current graph for an electrical component is shown below:
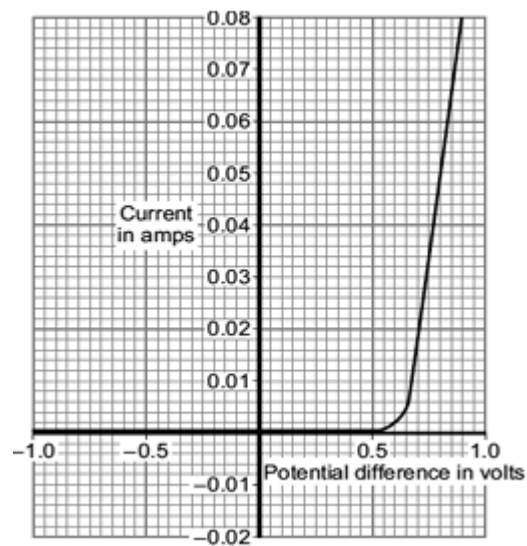

(Ck12.org, 2024)

    Identify the component.

     i   Standard resistor   ii   Light dependent resistor

     iii   Lamp

                                            iv   Diode

c) A pure silicon wafer is converted into a N-Type semiconductor by doping

    ....

     i   Boron   ii   Aluminium

     iii   Phosphorous

                                          iv   Indium

d) A magnet with south pole is moved towards a coil of insulated copper wire.

A voltmeter is connected across the coil shows a positive voltage.
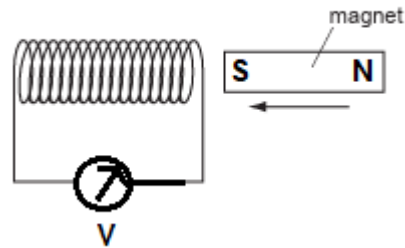
A higher voltage will be produced in the voltmeter if the

i   magnet is moved away from the coil with the same speed.

ii   magnet is moved towards the coil with much faster speed.

iii   magnet is moved away from the coil with the same speed.

iv   Magnet is moved away from the coil with slower speed

e) The resistance of semiconductors at very low temperatures will be

i   Extremely high   ii   High

iii   Low   iv   Extremely low

f)   Which of the following transformer arrangement produces an output voltage that is smaller than the input voltage?
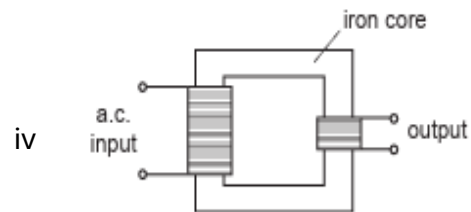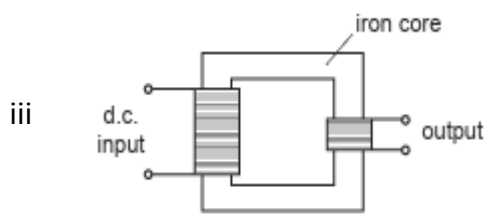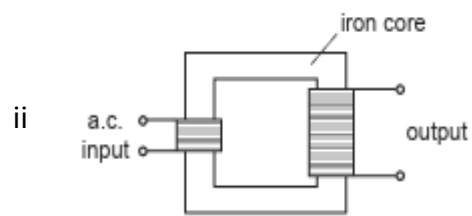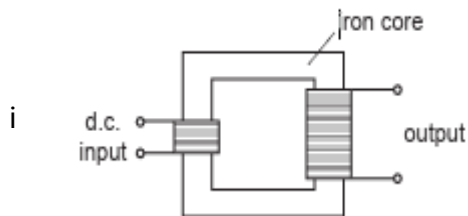
(Kohli, 2024)

Question 2   **[9 marks]**

a) Differentiate between   a P-type semiconductor and N-type semiconductor in your   (2 marks)
    own words in not more than 50 words.

b)   Diodes are active components in electronic circuits which are used in many types of
     applications.

   i) A group of students design a circuit using two diodes , a load resistor and a center

       tap transformer for converting an AC supply to a DC voltage.

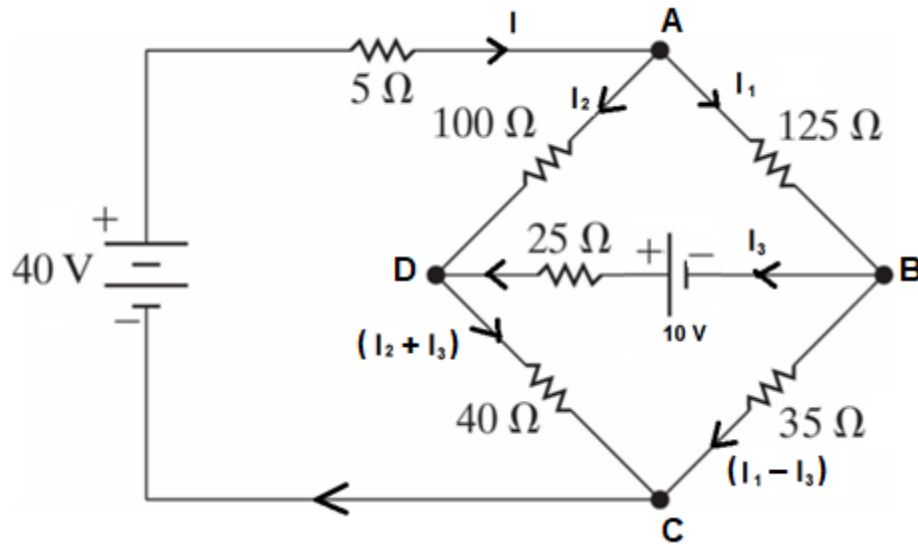   Draw a neat and labelled full wave rectifier circuit diagram.

                                                                                                  (3 marks)

ii) Explain the working of the above circuit by showing the input and output wave forms.

(3 marks)

iii) State any two disadvantage of this circuit.

(1 mark)

Question 3   **[8 marks]**

A complex network circuit with resistors and voltage sources are designed for a process control circuit board.

Pearson education,(2011)

By applying the Kirchhoff's current law (KCL) and Kirchhoff's voltage law (KVL),

a) Determine the current I_3 in the resistor 25 Ω .   (6 marks)

b) Calculate the voltage drop across the 40 Ω resistor   (2 marks)

Question 4   **[11 marks]**

In industries, the electricity is generated with the help of electrical machines such as generators which is based on the principle of electromagnetic induction.

a) State the faraday's law of electromagnetic induction. Write its mathematical form as well.   (2 marks)

b) A coil of many turns is rotated in a magnetic field using a mechanical drive as shown in the figure given below:
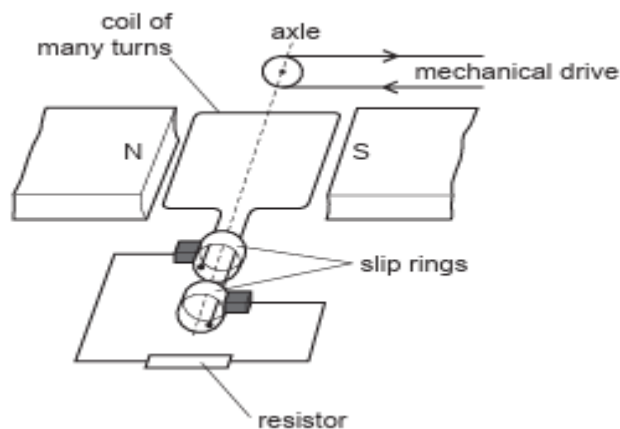
(Dutta, 2016)

i) Draw the induced AC voltage output obtained across the resistor.   (1 mark)

ii) Write the equation of the above AC induced voltage.   (1 mark)

iii) How you can modify the above diagram to get an induced DC voltage.   (1 mark)

c) A series RLC circuit containing a resistance of 12Ω, an inductance of 0.15H and a

capacitor of 100uF are connected in series across a 100V, 50Hz supply.

$$R = 12\Omega \qquad L = 0.15H \qquad C = 100uF$$

$V_R \qquad V_L \qquad V_C$

I

$V_S = 100V, 50Hz$
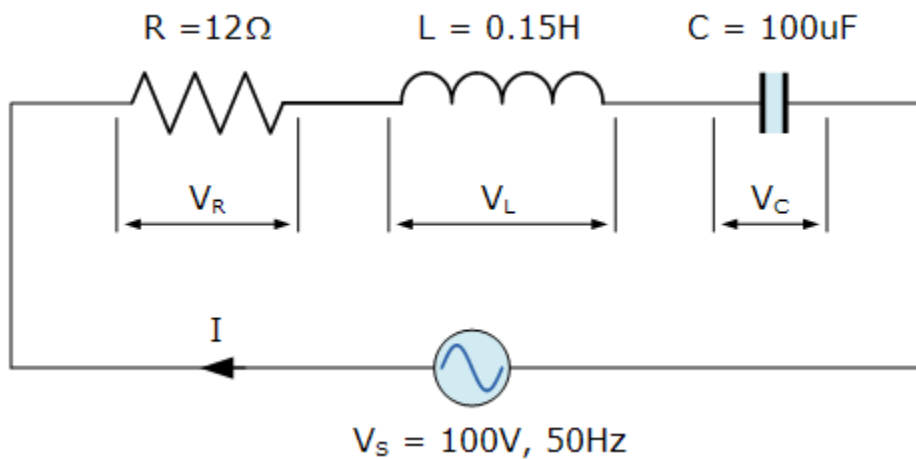
(Basic Electronics Tutorials, 2013)

i) Calculate the total impedance of the circuit   (4 marks)

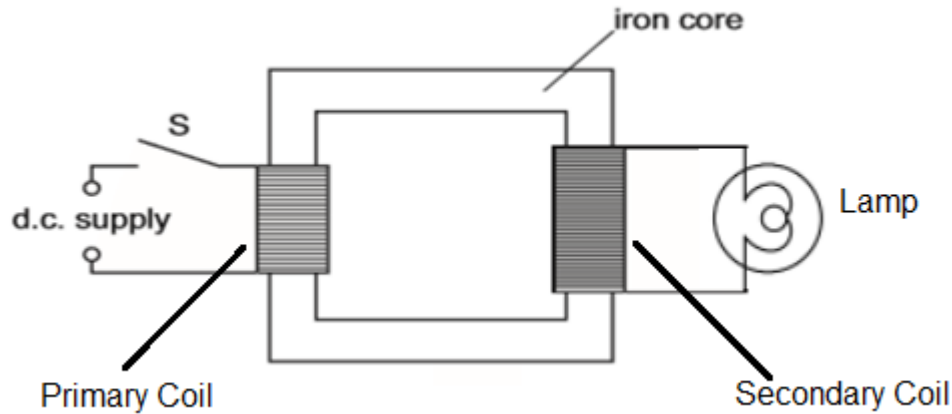ii) Calculate the maximum current flowing the circuit.

(2 marks)

Question 5   **[6 marks]**

The figure given below shows a D.C. supply connected to the input coil of a transformer.

(Electrical Deck, n.d.)

a) When the switch S is closed, predict whether the lamp will show some brightness.

(1.5 marks)

   Justify your answer.

b) Identify the transformer shown in the figure given above as STEP UP or STEP DOWN.   (1.5 marks)

   Justify your answer by giving suitable reasons.

c) A transformer has a primary coil of 2400 turns, a secondary coil of 12000 turns and an input voltage of 240V.

   i) Calculate the output voltage developed in the secondary coil.

(1.5 marks)

   ii) Calculate the output current if the power developed in the coil is 2 kW.

(1.5 marks)

MLO and Bloom's Level of Complexity

Q #	MLO Addressed	Complexity Level	Mark	Remark
1	**1,3**	Knowledge, Analyse	**6**	
2	**1,3,4**	Knowledge, Analyse, Evaluate	**9**	
3	**2**	Apply	**8**	
4	**1,2,3**	Knowledge, Apply , Analysis	**11**	
5	**2,3**	Analyse and Apply	**6**	

Reference

Kohli, V. (2024). *Step up vs. Step down transformer – what's the difference?* [online] Power & Beyond. Available at: https://www.power-and-beyond.com/step-up-vs-step-down-transformer-whats-the-difference-a-68507d29acd5d7bb838f803a11cfa1ec/.

Dutta, D. (2016). Discuss the Principal of A.C Generator by labelled diagram. [online] learnphysics. Available at: https://withdebasishsir.wixsite.com/learnphysics/single-post/2016/08/08/discuss-the-principal-of-ac-generator-by-labelled-diagram.

Basic Electronics Tutorials. (2013). Series RLC Circuit and RLC Series Circuit Analysis. [online] Available at: https://www.electronics-tutorials.ws/accircuits/series-circuit.html.