الجامعة الوطنية
National University
Science & Technology للعلوم والتكنولوجيا
كلية عمان البحرية الدولية
International Maritime College Oman

Final Exam

TBEEE: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Spring 2025

Points of attention:

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

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

	40
	10

Student Information

Name: ID:

Signature:

Invigilator

Initials: ☐ Student ID checked

Time received:

Question 1 **[6 marks]**

MCQ questions – Each question carries one mark.

a) The number of turns in the primary and secondary of a transformer coil is N_p and N_s respectively.
Which of the following statements represents a Step-down Transformer.

i $N_p > N_s$ ii $N_p < N_s$

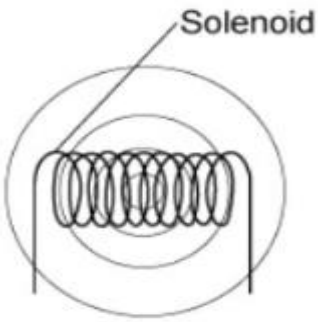
iii $N_p > N_s$ iv $N_p > N_s$

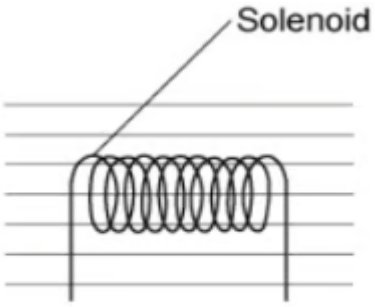
b) The type of material obtained when an intrinsic semiconductor is doped with pentavalent impurity is

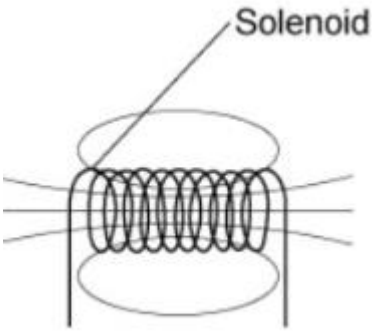
i N - Type ii P - Type

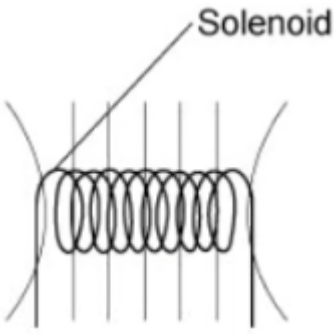
iii PN - Type iv NPN - Type

c) Four students in the lab class are asked to draw the magnetic field pattern due to a current carrying solenoid. Choose the correct choice from the pattern given below.

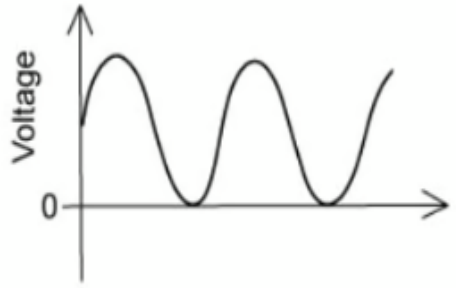
i 

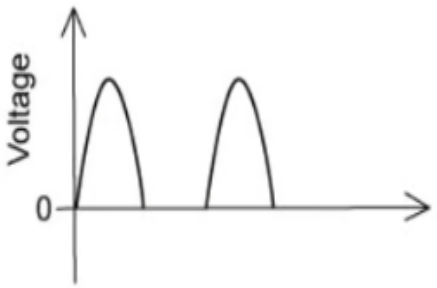
ii 

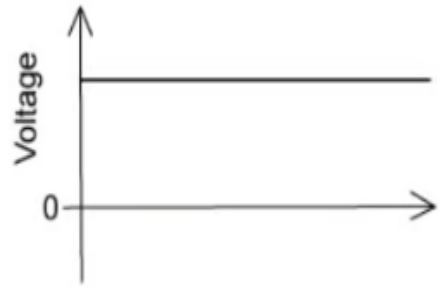
iii 

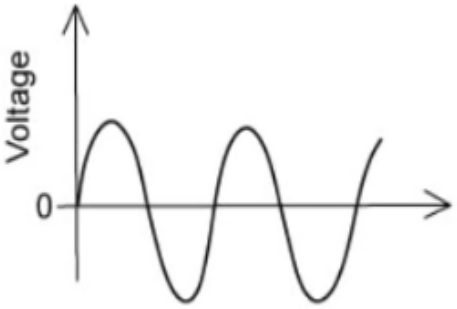
iv 

d) One of the wave form below represents the output from an AC generator. Choose the correct wave form.

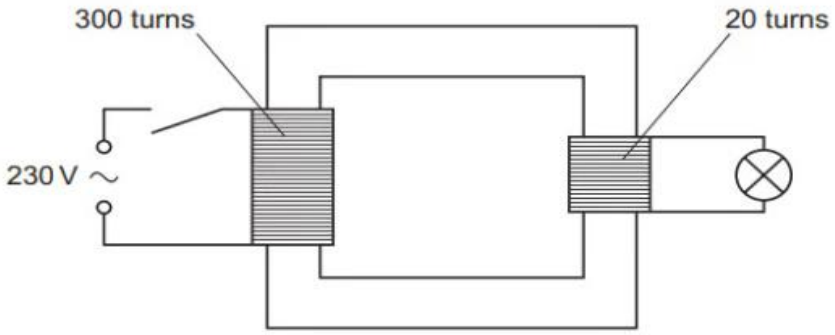
i 

ii 

iii 

iv 

e) A student has a lamp that can work on a maximum of 6 V . He wishes to light the lamp using a transformer as shown in the figure below. When the circuit is switch is ON, the lamp will



i not light at all

ii lights at normal brightness

iii lights up very dimly

iv light up brightly and then goes off

f) The barrier potential for an unbiased silicon junction diode at room temperature is.....

i 0.7 V ii 0.2 V

iii 0.3 V iv 1.2 V

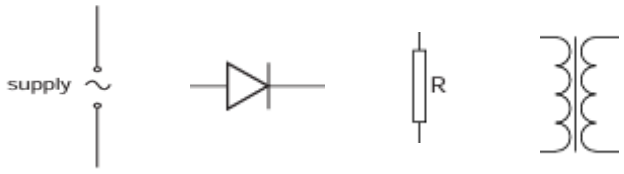
Question 2 **[9 marks]**

a) Differentiate between an electrical device and an electronic device in your own words in not more than 50 words. (2 marks)

b) Rectification process is widely used when electronic devices are used in our day-to-day life.

i) Define the term “Rectification”. (1 mark)

ii) A group of students design a circuit using some components for rectification purpose as shown below.

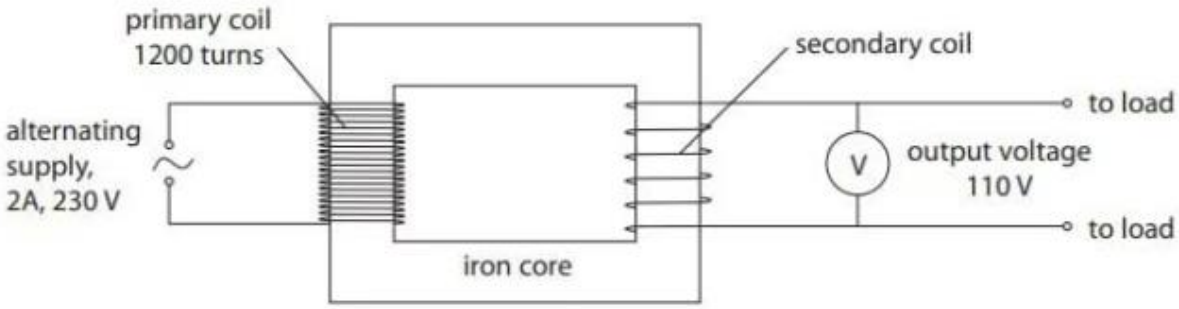


Draw a neat and labelled rectifier circuit diagram using the above components with more than 80% efficiency. (3 marks)

iii) Explain the working of the above circuit by showing the input and output wave forms. (3 marks)

Question 3 **[8 marks]**

The diagram shows a transformer that is 95% efficient.



(Onlinetuition.com.my, 2025)

a) State the equation showing the relationship between the input and output voltage with the turn ratio in a transformer. (1 mark)

b) Name the quantity which remains constant in a transformer apart from power. (1 mark)

c) Calculate the number of secondary coil turns from the above given figure. (2 marks)

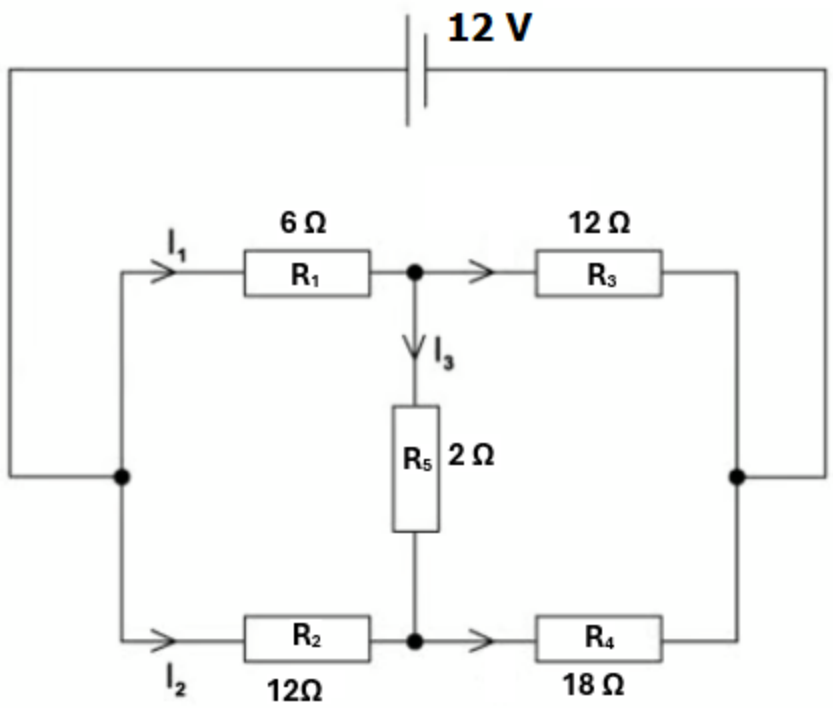
d) Calculate the secondary coil current flowing through the load. (2 marks)

e) Explain the working principle of a transformer. In your answer, you should include the reasons for using (2 marks)

- two coils
- an iron core
- an alternating supply

Question 4 **[8 marks]**

The diagram shows currents in the different branches of a circuit connected to a cell of 12 V.

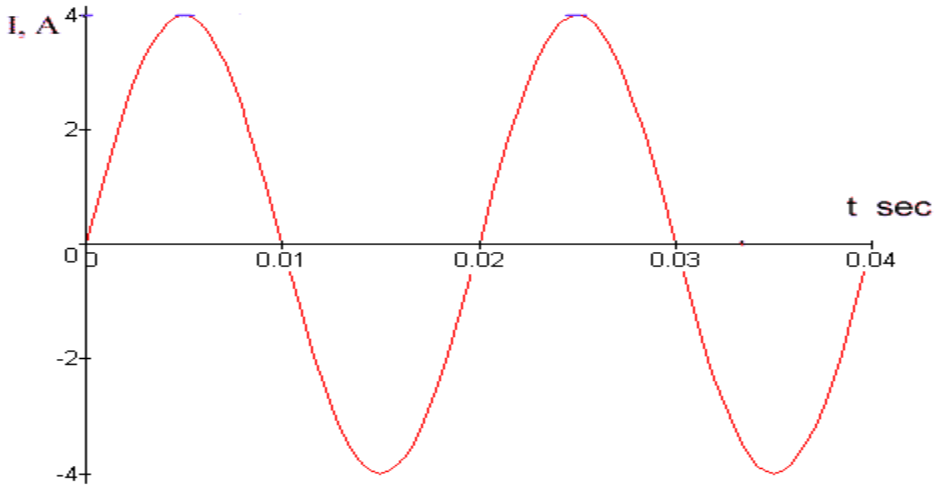


a) Determine the current I_3 in the resistor 2Ω . (6 marks)

b) For what value of resistor R_4 , the current I_3 in the circuit will be zero.? (2 marks

Question 5 **[9 marks]**

An AC sine wave output is generated by rotating a coil in a magnetic field is shown in the figure given below:



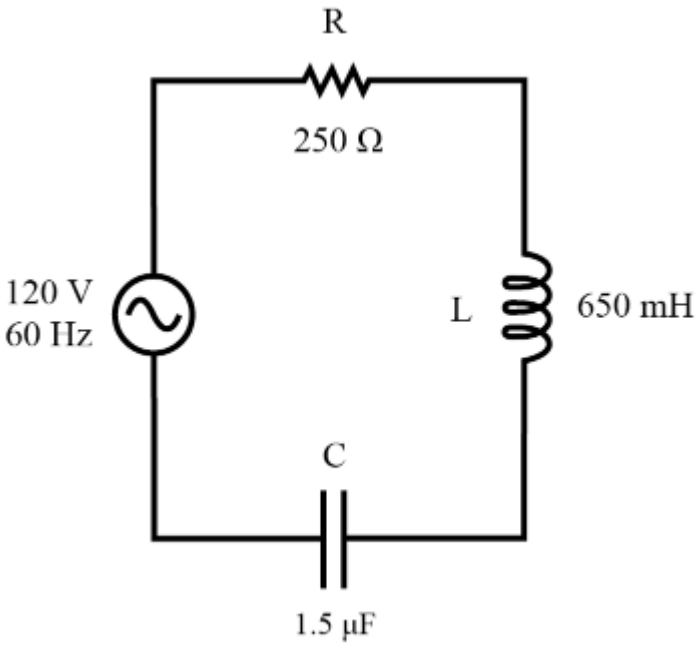
(Circuit-magic.com, 2025)

a) Write the amplitude, and time period of the output wave . (1 mark)

b) State the current equation of the AC wave output. (1 mark)

c) Calculate the r.m.s value of the current ($\mathbf{I_{rms}}$). (1 mark)

d) A series LCR circuit with 250 Ω resistor, 1.5 µF capacitor and 650 mH inductor is fed with a 120 V, 60 Hz AC supply as shown in the figure below:



(Kuphaldt, 2015)

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

ii) Calculate the maximum current flowing the circuit.

(2 marks)

MLO and Bloom's Level of Complexity

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

Reference

Nagwa (2023). *Lesson Explainer: The Magnetic Field due to a Current in a Solenoid | Nagwa*. [online] www.nagwa.com. Available at: https://www.nagwa.com/en/explainers/186157825721/.

Onlinetuition.com.my. (2025). *Types of Transformer*. [online] Available at: http://spmphysics.onlinetuition.com.my/2013/10/types-of-transformer.html [Accessed 10 May 2025].

Circuit-magic.com. (2025). Alternating Current (AC), Voltage, sinusoidal Waveform. [online] Available at: https://www.circuit-magic.com/sinusoidal_circuits_analysis.htm [Accessed 10 May 2025].

Kuphaldt, T.R. (2015). Series R, L, and C. [online] Allaboutcircuits.com. Available at: https://www.allaboutcircuits.com/textbook/alternating-current/chpt-5/series-r-l-and-c/.