UNIVERSITI KUALA LUMPUR

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MALAYSIA ITALY DESIGN INSTITUTE

FINAL EXAMINATION
MARCH 2026 SEMESTER

COURSE CODE	:	PWD 10202
COURSE NAME	:	BASIC ELECTRONICS RAILWAY
PROGRAMME NAME	:	DIPLOMA ENGINEERING TECHNOLOGY IN RAILWAY SYSTEM
DATE	:	23 JUNE 2026
TIME	:	9.00 AM – 11.30 AM
DURATION	:	2 HOURS AND 30 MINUTES

INSTRUCTIONS TO CANDIDATES

1. Please CAREFULLY read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of Section A and Section B.
4. Answer all questions in Section A and answer only TWO (2) in Section B.
5. Please write your answers on the answer booklet provided.
6. Answer all questions in English language ONLY.
7. Related formulas have been appended for your reference.

THERE ARE 7 PAGES OF QUESTIONS, INCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

1. What is the voltage drop of a standard germanium diode?

(4 marks)

2. Name the state of an ideal diode when the voltage at its cathode is greater than the voltage at its anode?

(4 marks)

3. A silicon diode is connected in series with a 1 kΩ resistor and a 10 V DC source. Calculate the diode current I_D and diode voltage, V_D.

(8 marks)

4. What is meant by Active region and Saturation region of a BJT.

(8 marks)

5. State the main differences between Class A Amplifier and Class B Amplifier.

(4 marks)

6. Name FOUR (4) Power Electronics devices and state their main application.

(8 marks)

7. State one application each for Rectifier, Converter and Inverter in an Electric Train Control system.

(6 marks)

8. An operational amplifier (op-amp) is a versatile, high-gain voltage amplifier integrated circuit. Name the TWO (2) inputs of an Op-amp.

(4 marks)

9. Refer to below table. A DC motor can operate in two modes –*motoring and breaking*. State the quadrant number, the speed sign, the torque sign and power output sign (+ve or -ve) for the following motor function;

I. Reverse Motoring Function

II. Reverse Braking Function

Function	Quadrant	Speed	Torque	Power Output
Forward Motoring	1	+	+	+
Forward Braking	2	+	-	-
Reverse Motoring	**?**	**?**	**?**	**?**
Reverse Braking	**?**	**?**	**?**	**?**

(8 marks)

10. Explain what is meant by Generative Braking, Dynamic Braking and Plugging Braking?

(6 marks)

SECTION B: (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions only.
Please use the answer booklet provided.

Question 1

Refer to the Fullwave Rectifier circuit in Figure 1. If given Vin = 130Vrms and the ratio between Primary and Secondary Transformer is 1:2, solve the followings:

(a) Explain the circuit operation.

(3 marks)

(b) What is the main application of this circuit?

(3 marks)

(c) Calculate Vp of the secondary transformer, I_{RL} and P_{RL}.

(8 marks)

(d) On the same axis, sketch the input voltage and voltage waveform across point BC. What is the main function of Capacitor connected in parallel to R_L?

(6 marks)

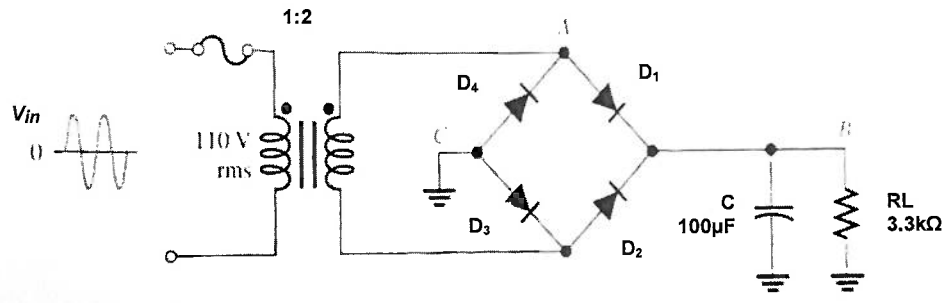


Figure 1 Fullwave Rectifier Circuit

Question 2

An inverting summing amplifier circuit has four inputs with V_1=2.0V, V_2= -1.5V, V_3 = -1.0V and V_4 =3.0V. The respective input resistors are R_1 =15kΩ, R_2 =20kΩ , R_3 =20kΩ and R_4=30kΩ. If the feedback resistor is Rf =60k and the op-amp is powered by a dual supply of 15V, solve the following problems;

(a) Calculate the individual gain for each input.

(4 marks)

(b) Calculate the output voltage V_{out}.

(4 marks)

(c) If R2 is open, calculate the output voltage V_{out}.

(4 marks)

(d) If V_1 is changed to 5.0V while the other input voltages stay the same, determine the new output voltage.

(4 marks)

(e). Will the op-amp delivered the output as calculated in question Q2(d)? Why?

(4 marks)

Question 3

Refer to Figure 2. Determine the following DC parameters if given V_{CC} = 30V and Vin = 15mV.

(a) Calculate the base voltage, V_B.

(3 marks)

(b) Calculate the emitter voltage, V_E and emitter current, I_E

(6 marks)

(c) Determine the transistor parameter, r_e.

(3 marks)

(d) Calculate the voltage gain without bypass Capacitor, A_V and the voltage gain with bypass Capacitor, A_V

(8 marks)

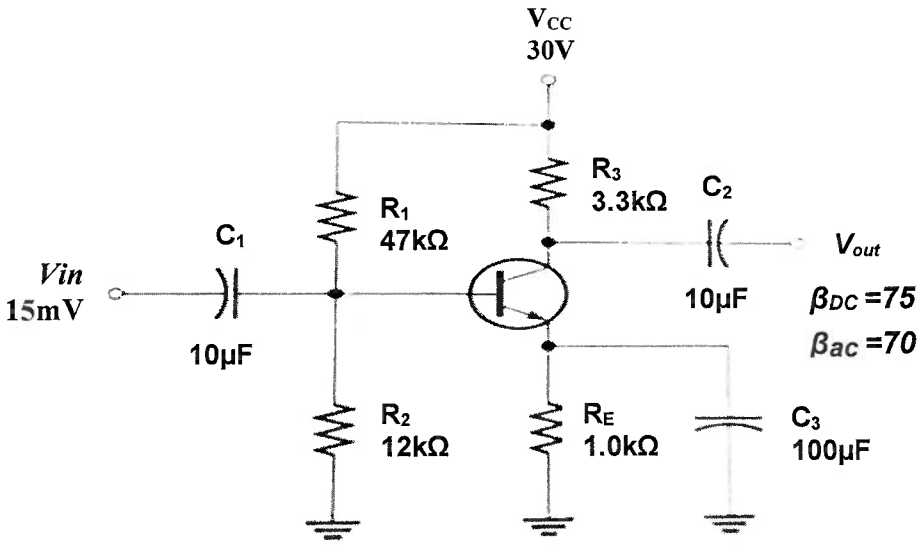


Figure 2 Common-emitter (CE) Amplifier

END OF EXAMINATION PAPER

REFERENCE FOR RELATED FORMULAS

1)	Ohm's law	$V = IR$
2)	Power	$P = IV$ or $P = I^2R$ or $P = V^2/R$
3)	Transistor parameter	$re = (25mV) / (I_E)$
4)	Emitter current	$I_E = V_E / R_E$
5)	Base voltage	$V_B = [R_2 / (R_1+R_2)] \times V_C$
6)	Voltage gain of transistor (without bypass Capacitor)	$Av = (R_C) / (re + R_E)$
7)	Voltage gain of transistor (with bypass Capacitor)	$Av = (R_C) / (re)$
8)	Conversion of Vp to Vrms	$V_{rms} = V_p \times 0.707$