



UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2016/2017**

COURSE NAME : ELECTRONIC DRIVES AND APPLICATION
COURSE CODE : BND 40903
PROGRAMME CODE : BND
EXAMINATION DATE : JUNE 2017
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF SIX (6) PAGES

- Q1** (a) About 50% of the generated electrical energy is used for drives.
- (i) Define electronic drives. (2 marks)
 - (ii) Draw the block diagram of basic elements of an electronic drives system and list the components in each unit. (7 marks)
 - (iii) Give examples of electronic drives applications. (2 marks)
- (b) State **THREE (3)** advantages of an electronic drives system. (3 marks)
- (c) List **THREE (3)** factors affecting the selection of electronic drives. (3 marks)
- (d) Prime movers are required in electronic drives system to provide movement or motion and energy. List **THREE (3)** examples of prime movers. (3 marks)
- Q2** (a) Sketch the following DC motor schematic diagram and list **TWO (2)** applications of each motor:-
- (i) DC series motor
 - (ii) DC shunt motor
 - (iii) DC compound motor
- (12 marks)
- (b) Explain why DC series motor should never be started on no-load? (2 marks)
- (c) A series-connected DC motor has an armature resistance of 1.0Ω and field winding resistance of 2.5Ω . In driving a certain load at 500 rpm, the current drawn by the motor is 25 A from a voltage source of $V_T = 200 \text{ V}$. The rotational loss is 125 W. Find:-
- (i) Output power
 - (ii) Efficiency
- (6 marks)
- Q3** (a) Name **THREE (3)** methods of speed control in DC motors. (3 marks)
- (b) What are the advantages of field control method? (2 marks)

- (c) A thyristor bridge is a technique commonly used to control the speed of a DC motor by varying the DC voltage. The amount of voltage is controlled by the gating angle, α of the thyristor.
- (i) By referring to **Figure Q3(c)(i)**, find the rectified DC voltage, V_a when the gating angle is 43.56° . What is the value of CEMF when the voltage drop across R_a is 0 V? (4 marks)
- (ii) By referring to **Figure Q3(c)(ii)**, find the rectified DC voltage, V_a when the gating angle is 36.37° . What is the value of CEMF when the voltage drop across R_a is 50 V? (4 marks)
- (d) If you were given the job of servicing and maintaining of electronic drives of a manufacturing plant, outline how you plan to do the job and why? (7 marks)

- Q4** (a) Define AC drives and give **TWO (2)** examples of its applications. (3 marks)
- (b) Differentiate and explain DC and AC Drives in terms of:-
Choose **TWO (2)**.
- Power conversion
 - Circuit complexity
 - Cost effectiveness
- (4 marks)
- (c) There are three different types of AC Adjustable Speed Drive (ASD) on the market that primarily differ in the type of rectification they use to convert AC to DC and back to AC. Explain the advantage and disadvantage of the following types of ASD:-
- (i) Variable Voltage Input (VVI) as in **Figure Q4(c)(i)**
(ii) Current Source Input (CSI) as in **Figure Q4(c)(ii)**
(iii) Pulse Width Modulated (PWM) as in **Figure Q4(c)(iii)**
- (6 marks)
- (d) A fixed speed pump operates 6000 hours per year at 1450 rpm delivering flow of $125 \text{ m}^3/\text{hr}$ against a pressure head of 32 m, and absorbs 15.1 kW. It is possible to reduce the flow demand by 25% for 60% of the operating time. Calculate the associated energy saving potential (unit: kWh), and the electrical cost savings (unit: RM/year) given an electricity price of RM 0.40/kWh. (7 marks)

Q5 (a) Electronic drive equipment does not necessarily have to be located next to the motor it is controlling. An appropriate enclosure at the right environment will protect the drive. Analyze which of these factors are important to consider when selecting an enclosure for electronic drives. Choose **FIVE (5)** of the following and explain each factor:-

- Total heat content
- Ventilation
- Color
- Size
- Price
- Cooling
- Layout of drives

(10 marks)

(b) Compressor is widely used in industrial automation. Draw the mechanics diagram of compressor's drive system with labeling and give example of:-

- (i) Possible user of compressor
- (ii) Application of compressor
- (iii) Commonly used drive for compressor
- (iv) Benefit of using the drive to the compressor

(10 marks)

-END OF QUESTIONS -

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2016/2017
COURSE NAME : ELECTRONIC DRIVES AND APPLICATION

PROGRAMME CODE : BND
COURSE CODE : BND 40903

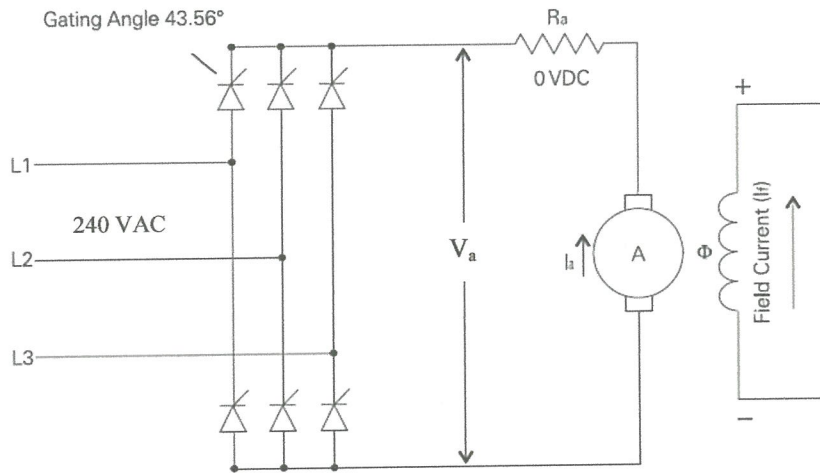


Figure Q3(c)(i)

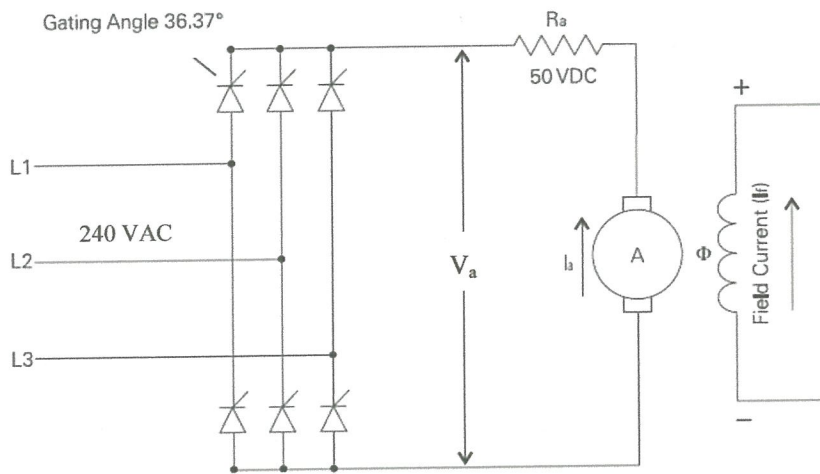


Figure Q3(c)(ii)

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2016/2017 PROGRAMME CODE : BND
COURSE NAME : ELECTRONIC DRIVES AND APPLICATION COURSE CODE : BND 40903

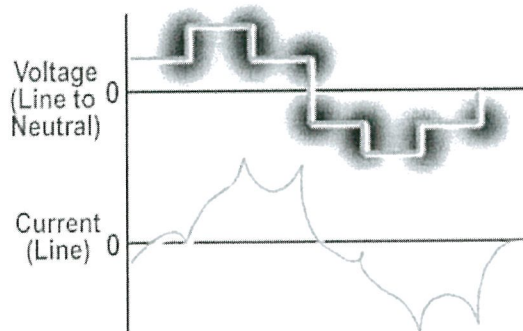


Figure Q4(c)(i)

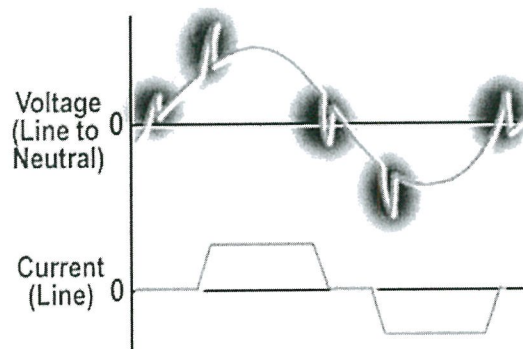


Figure Q4(c)(ii)

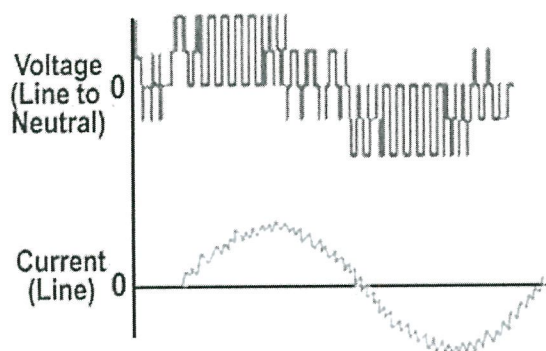


Figure Q4(c)(iii)