



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

DIPLOMA IN TECHNOLOGY

ELECTRICAL & POWER ENGINEERING

EEP 33201: MACHINES & UTILIZATION III

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Scientific calculator*
- *SMP table*

This paper consists of **FIVE** questions. Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are clearly shown.

This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question 1

- a) (i) State any **THREE** advantages in the use of variable Speed Drives
- (ii) Distinguish between Plugging and Magnetic Flux weakening in speed DC Motor speed control
- (iii) Draw a circuit and the corresponding waveforms for a Constant Current Inverter. (12 marks)
- b) A single quadrant chopper is used for Rheostatic Braking of a separately excited DC Motor. $R_a = 0.5 \Omega$, braking Resistance = 7.5Ω , voltage constant = 1.4V/A/rad/s , $I_a = 120\text{A}$, and the Field Current = 1.6A . The Duty Cycle is 0.35 . Calculate:
- Average Voltage across the Chopper
 - The power Dissipated in the Braking Resistance
 - The Motor Speed (8 marks)

SECTION B (Answer any TWO questions from this section - 20 marks each)

Question 2

- a) (i) With the aid of a Circuit Diagram explain the working principle of a 3-phase full wave Converter drive
- (ii) Derive the average output value of the converter in a (i) above (10 marks)
- b) A 230V , 50HZ , single Phase, feeds the Armature and Field Circuit of a separately excited DC Motor through a corresponding full wave converter. The armature and Field resistances are 0.25Ω and 200Ω respectively. The Torque and Voltage constants are 1.1 . The firing angle for the Field and Armature converters are 0° and 45° respectively, while the Armature Current is 50A . Assuming a brush contact Voltage Drop of 1V per Brush, Determine:
- The Torque Developed
 - The Motor Speed (10 marks)

Question 3

- a) (i) Explain any **TWO** Techniques of speed control in Induction Motors
- (ii) State **TWO** disadvantages for each of the methods in 3a(i) above (6 marks)
- b) A 400V , 4 pole, 50HZ , 3 Phase Star Connected Induction Motor has the following Parameters:
- Stator to Rotor Turns Ratio = 2.1 $R_2 = 0.08 \Omega$

