



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Electrical and Electronic engineering

UNIVERSITY EXAMINATION:

Diploma in Electrical Power Engineering (DEPE 5)

ELECTRICAL MACHINES II

EEP 2301

END OF SEMESTER EXAMINATION

SERIES: DEC 2016

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** Questions;. Attempt any **THREE** Questions.

Do not write on the question paper.

Question ONE

- (a) Explain the need for consumers to improve power factor. (4 marks)
- (b) Explain with the aid of a phasor diagram how a three phase synchronous motor operates with a varying power factor. (8 marks)
- (c) A factory having a three phase load of 600KVA at a power factor of 0.7 lagging is to be connected in parallel with a three phase synchronous motor to cater for an additional 187kW and the motor operates at an efficiency of 90%. The motor is also used to improve the power factor of the factory to 0.95 lagging.
Determine:
- (i) The leading KVA_r of the motor
 - (ii) KVA rating of motor
 - (iii) Power factor at which motor operates
- (8 marks)

Question TWO

- (a) State the condition to be met in order for three phase transformers to be connected in parallel. (4 marks)
- (b) State FOUR transformer groups and state what determines these groupings. (8 marks)
- (c) Two three phase transformers rated at 1000 kVA and 500 KVA are connected in parallel to share a load of 1400 KVA at 0.866 pf lagging. The two transformers have the same transformation ratio of 6600/400 delta star. If the equivalent secondary impedance of the transformers are $(0.001 + j0.003)\Omega$ and $(0.0028 + j0.005)\Omega$ respectively. Determine the loading and power factor of each transformer. (8 marks)

Question THREE

- (a) State the conditions to be satisfied in order for three phase transformers to be operated in parallel. (4 marks)
- (b) State the FOUR groups in which transformers are classified and state what determines the classification. (8 marks)
- (c) A 400KVA transformer having 0.01 p.u. resistance and 0.05p.u. reactance is connected in parallel with 200KVA transformer 0.012p.u. resistance and 0.04p.u. reactance. Determine how they share a load of 600KVA at 0.8pf lagging. (8 marks)

Question FOUR

- (a) Explain why it is advisable to improve a consumers power factor. (4 marks)
- (b) Explain why a synchronous motor is referred to as a synchronous condenser. (4 marks)
- (c) A 2300V 60Hz six pole synchronous motor drives a constant torque load of 5000Nm. The synchronous reactance of the motor is 6Ω . Determine the minimum excitation that the machine must maintain to provide the required torque. (12 marks)

Question FIVE

(a) Explain the following:

- (i) Hunting in synchronous motor
- (ii) Causes of hunting
- (iii) How hunting is countered
- (iv) Pull out torque

(10 marks)

(b) Explain the effect of adding load on a synchronous motor.

(5 marks)

(c) Explain the lamps dark method of synchronizing.

(5 marks)