



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of Mechanical & Automotive Engineering
UNIVERSITY EXAMINATION FOR:
Diploma in Mechanical Engineering (Plant Option, Y3S2)
EPL 2306 : Plant Electrical IV (Paper 1)
SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: SEPTEMBER 2018
TIME: 2 HOURS
DATE: Sep 2018

Instruction to Candidates:

You should have the following for this examination

- *Examination Pass & Student ID Card*
- *Answer booklet*
- *Non-Programmable scientific calculator*

This paper consists of **FIVE** questions. Attempt any **THREE** questions.

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

Do not write on the question paper.

Question ONE

- Describe differences in construction between core-type and shell-type transformer and state the advantages of each. **(8 marks)**
- Describe the different methods used in cooling Power and Distribution transformer. **(8 marks)**
- Determine the peak value of sinusoidal flux in a transformer core that has a primary of 200 turns and is connected to a 240 V, 60 Hz, 50 KVA source. **(4 marks)**

Question TWO

- With the aid of suitable sketches, explain how rotating flux causes squirrel-cage rotor to rotate. **(10 marks)**
- The frequency and induced voltage in the rotor of a certain six-pole wound-rotor induction motor, whose shaft is blocked, are 60Hz and 100V, respectively. Determine the corresponding values when the rotor is running at 1000 rpm. **(4 marks)**
- Explain how dynamic braking is accomplished, using (i) DC injection (ii) Capacitors. **(6 marks)**

Question THREE

- a) Explain how a capacitance – start split-phase induction motor develops a rotating magnetic field. (6 marks)
- b) What are the different methods of starting single phase induction motors? Discuss briefly. (8 marks)
- c) A single-phase induction motor has an output torque of 0.25 Nm and a speed of 100 rad/s. if the input current is 0.6 A at 230 V and 0.6 lagging p.f. Find; (i) Output power, (ii) efficiency. (6 marks)

Question FOUR

- a) Determine the speed of a 40-pole synchronous motor operating from a three-phase 50 Hz, 460 V system. (6 marks)
- b) Explain the dynamic braking process for synchronous motor. (8 marks)
- c) Determine the frequency required to operate a 16- pole, 480-V synchronous motor at 225 rpm. (6 marks)

Question FIVE

- a) Define slip in three-phase induction motor. (2 marks)
- b) Derive an expression for frequency of rotor current in a three-phase induction motor. (4 marks)
- c) A three- phase, 50 Hz induction motor has 6 poles and operates with a slip of 5% at a certain load. Determine: (10 marks)
- Speed of the rotor with respect to the starter,
 - frequency of the rotor current,
 - the speed of rotor magnetic field with respect to rotor,
 - speed of rotor magnetic field with respect to stator, and
 - the speed of the rotor magnetic field with respect to the stator magnetic field.
- d) Mention FOUR abnormal conditions in a three – phase induction motor. (4 marks)