TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING

EEP 2251: ELECTRICAL MACHINES & UTILIZATION II

END OF SEMESTER EXAMINATION

SERIES: AUGUST2019

TIME: 2HOURS

DATE: Pick DateAug2019

<u>Instructions to Candidates</u>
You should have the following for this examination
-*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) Distinguish between **apparent power** and reactive **power**.　　　　　(2marks)

b) Describe the 4-wire electricity distribution system.　　　　　(2marks)

c) Compare and contrast the **2-wattmeter** and **3-wattmeter** methods of measuring electrical power in 3-phase systems.　　　　　(3marks)

d) A balanced load consists of three coils, each of resistance 6 Ω and inductive reactance of 8 Ω, connected first in star and then in delta across a 400V, 3-phase supply. Calculate

　i)　the line current

　ii)　the power absorbed by the coils　　　　　(13marks)

QUESTION TWO

a) Distinguish between **salient-pole rotor** and **squirrel –cage rotor**   (2marks)

b) Compare and contrast induction motor and synchronous motor.   (3marks)

c) Explain how the speed of 3-phase induction motor varies with load.   (5marks)

d) A 3-phase induction motor is wound for 4-poles and is supplied from a 50Hz system.

Calculate.

    i)   the synchronous speed

    ii)   the speed of the motor when slip is 4%

    iii)   the rotor current frequency when the motor runs at 600 r.p.m   (10marks)

QUESTION THREE

a) Explain how the 3-phase synchronous motor is affected by

    i)   loading

    ii)   excitation   (10marks)

b) A 3-phase synchronous motor has 12 poles and operates from a 415V, 50Hz supply.

If it takes a line current of 100A at 0.8 power-factor lead, calculate

    i)   the motor speed

    ii)   the torque developed by the motor, neglecting losses.   (10marks)

QUESTION FOUR

a) With the aid of a labeled diagram, explain the principle of operation of a star- star, 3-phase transformer.   (6marks)

b) A 3-phase, 50Hz transformer has a delta- connected primary and star- connected secondary, the line voltage being 25,000V and 415V, respectively. The secondary has a star- connected balanced load at 0.8 power-factor lagging. The line current on the primary side is 5A.

Calculate

    i)   the current in the primary winding

    ii)   the current in the secondary winding

    iii)   the true power output of the transformer.   (14marks)

QUESTION FIVE

A machine, which is driven by an electric motor, has stopped running.

     i)   state **FIVE** likely causes for this failure, if the coupling between machine and motor is gear drive.

     ii)   Explain the remedial action to be taken to solve this problem.   (20marks)