# TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF MECHANICHAL AND AUTOMOTIVE ENGINEERING

## UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MARINE ENGINEERING

**EMR 2308: MARINE ELECTRICAL TECHNOLOGY I**

SPECIAL/SUPPLEMENTARY EXAMINATION

**SERIES: SEPTEMBER 2018**

**TIME: 2** HOURS

**DATE:** Sep 2018

**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)** A D.C motor takes an armature current of 170A at 480V. The armature circuit resistance is 0.5Ω. The machine has 8 poles and the armature is lap connected with 960 conductors. The flux per pole is 0.06wb. Calculate:

**i.** The speed

**ii.** The gross torque developed by the armature

**(8 marks)**

**b)** Explain how speed control is achieved in DC machines

**(4 marks)**

c)

i. Give the line and phase values of current and voltage in star connection

ii. Give the line and phase values of current and voltage in delta connection

**(4 marks)**

**d)** Explain how torque is produced in a three phase induction motor **(4 marks)**

**Question TWO**

**a)** A 220V d.c machine has an armature resistance of 0.6Ω. If the armature current is 30A. Find the induced e.m.f when the machine acts as

**i.** Generator

ii. Motor

**(4 marks)**

**b)** Describe the three main D.C generator characteristics

State the methods of generator excitations

**(9 marks)**

c) What is meant by electromagnetic torque in motors?

**(3 marks)**

**Question THREE**

**a)** What is synchronous speed

**(1 marks)**

**b)**

**I.** What are the two types of armature windings most commonly used for three phase alternators

**(2 marks)**

**II.** Giving two examples of each, classify AC motors as regards to :

Their principle of operation

Type of current used

Their speed

Their structural features **(8 marks)**

**c)** State the methods of finding voltage regulation in alternators clearly describing the common requirements for them to be effected **(9 marks)**

**Question FOUR**

a) Describe voltage regulation in alternators **(4 marks)**

**b)** Draw torque speed characteristics of a three phase induction motor. **(4 marks)**

**c)** Describe the working principle of an Induction motor

State why Three Phase Induction motors are self-starting and why Single Phase induction motors are not self-starting **(8 marks)**

d) Explain how speed control is achieved in DC machines

**(4 marks)**

**Question FIVE**

**a)** An 8 pole d.c generator has 800 conductors and a flux per pole of 0.04wb. Determine the EMF generated if it runs at 300 rev/min and is:

**i.** Wave wound

**ii.** The speed it must run to produce the same e.m.f when lap wound

**(8 marks)**

b) Synchronization of alternator means connecting an alternator into grid in parallel with many other alternators, that is in a live system of constant voltage and constant frequency describe the conditions necessary for this to take place

**(8 marks)**

**c)** Explain why an induction motor takes in a high starting current.

Explain why a synchronous motor cannot run at synchronous speed **(4 marks)**