TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT MECHANICHAL AND AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MARINE ENGINEERING

EMR 2221: MARINE ELECTRICAL TECHNOLOGY III

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.

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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)**