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**University Examinations 2014/2015**

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND ELECTRONIC ENGINEERING

**EEE 0223: ELECTRICAL MACHINES 1**

**DATE: DECEMBER 2014 TIME: 1**$\frac{1}{2}$ **HOURS**

**INSTRUCTIONS:** *Answer all questions in section A (question one is compulsory)**and any other* ***two*** *questions*

**SECTION A (30 MARKS)**

**QUESTION ONE**

1. State three types of industrial drives (3 marks)
2. The armature of a d.c machine has s resistance of 0.25Ω and is connected to 300v supply. Calculate the emf generated when it is running; (6 marks)
3. As a generator giving 100A
4. As a motor taking 80A
5. Given that V=E+IaRa; show that total electrical power supplied to the armature equals mechanical power developed by the armature plus copper losses and hence torque,

T= 6 marks)

1. Differentiate between a motor and a generator (2 marks)
2. An 8 pole de motor has wave wound armature with 900 conductors. The useful flux is 25mwb. Determine the torque exerted when a current 30A flows in each armature conductor. What would be the torque if the machine was wound? (6 marks)
3. Draw the following interconnection for d.c motors (6 marks)
4. Series
5. Shunt
6. Compound
7. State the material used to make brushes of a d.c motor (1 mark)

**SECTION B**

**QUESTION TWO**

A six pole lap wound motor is connected to a 250V d.c supply. The armature has 500 conductors and resistance of 1Ω. Flux per pole is 20mwb; Calculate

1. Back emf
2. Speed developed
3. The torque developed when armature current is 40A (9 marks)
4. Draw the performance of a d.c motor connected in series configuration (4 marks)
5. State two factors that dictate the speed of d.c machines (....marks)

**QUESTION THREE**

A 240v shunt motor takes a total current of 30A. If the field winding resistance Rf=150$Ω$ and the armature resistance Ra=0.4$ Ω$ , determine

1. Current in the armature (4 marks)
2. Back emf (4 marks)
3. Draw (6 marks)
4. The torque armature characteristics
5. Speed armature current characteristic for a d.c motor

 d) Enumerate one application of d.c machines (1 mark)

**QUESTION FOUR**

1. With aid of a well labelled diagram explain the constructional and operational features of a d.c machine (8 marks)
2. Explain the operation of a face plate starter for a d.c machine. Use diagrams

(5 marks)

1. Draw the torque speed characteristics of a d.c motor (2 marks)

**QUESTION FIVE**

A d.c motor is shunt wound and has a supply of 220v, 50Hz with speed of 800rev/min and an armature current of 30A. The armature circuit resistance is 0.4$ Ω$. Determine

1. Maximum value of armature current if flux is suddenly reduced by 10%
2. Steady state value of armature current at new value of flux assuming shaft torque of the motor remains constant (8 marks)

For the motor connection above determine the maximum efficiency (6 marks)