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**University Examinations 2014/2015**

SECOND YEAR, FIRST SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL ENGINEERING

**EEE 2202: ELECTRICAL MACHINES I**

**DATE: AUGUST, 2015 TIME: 1½ HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE – 30 MARKS**

1. State three ways of improving commutation in D.C machines. (3 Marks)
2. With the aid of well-labelled diagram explain the construction of a d.c machine(7 Marks)
3. Explain three energy losses of a generator. (3 Marks)
4. State two applications of d.c motors. ( 2 Marks)
5. An 8 pole lap-wound armature of a d.c generator has 1500 conductors and a flux per pole of 0.03wb. Determine the emf generated when it is running at 500 rev/min. (4 Marks)
6. With the aid of a diagram differentiate between a long shunt and short shunt wound dc machines. (4 Marks)
7. Explain three types of motor protection. (3 Marks)
8. Draw the following arrangements of dc machines;
9. Short shunt (2 Marks)
10. Long shunt (2 Marks)

**QUESTION TWO (15 MARKS)**

1. A 10kw shunt generator having an amature circuit resistance of 0.75𝛺 and a field resistance of 125, generates a terminal voltage of 250v at full load. Determine the efficiency of the generator at full load, assuming the iron, friction and windage losses amount to 600w.

(7 Marks)

1. A 250v series motor draws a current of 40A. The amature resistance is 0.15𝛺 and the field resistance is 0.5𝛺. Determine the maximum efficiency of the motor. (8 Marks)

**QUESTION THREE (15 MARKS)**

1. A 6pole lap wound motor is connected to a 250vdc supply. The amature has 500 conductors and a resistance of 1𝛺. The flux per pole is 20mwb. Calculate:
2. The speed of the motor (3 Marks)
3. the torque developed when the amature current is 40A (3 Marks)
4. The shaft torque of a motor driving a 100V dc shunt-wound generator is 25Nm. The amature current of the generator is 16 A at this torque. If the shunt field regulator is adjusted so that the flux is reduced by 15%, the torque increases to 35Nm. Determine the amature current at this new value of torque. (5 Marks)
5. Sketch the following load characteristics of shunt-wound motor;
6. torque/amature current (2 Marks)
7. Speed/ amature current (2 Marks)

**QUESTION FOUR (15 MARKS)**

1. With the aid of a diagram, describe the dc motor starter. (5 Marks)
2. Explain how the speed of the following motors is controlled;
3. Shunt-wound dc motor (4 Marks)
4. Series-wound dc motors (6 Marks)