MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.
Tel: 020-2069349, 061-2309217. 064-30320 Cell phone: +254 712524293, +254 789151411
Fax: 064-30321
Website: www.must.ac.ke Email: info@must.ac.ke

University Examinations 2013/2014

SECOND YEAR, FIRST SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL
ENGINEERING

EEE 0223: ELECTRICAL MACHINES I

DATE: APRIL 2014   **TIME: 1 ½ HOURS**

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

QUESTION ONE – (30 MARKS)

(a) A 500V shunt motor runs at its normal speed of 250rpm. When the armature current is
200A. The armature resistance is 0.12Ω calculate the speed when a resistance is inserted
in the field reducing the shunt field to 80% of normal value and armature current to
100A. Find the new speed under these conditions.   (6 Marks)

(b) State four merits of rheostatic field control method in speed control of d.c motors.
(5 Marks)

(c) With aid of appropriate diagram explain the rheostatic braking as applied to series motor.
(6 Marks)

(d) With aid of appropriate diagrams explain the construction of:
(i)   Wave windings
(ii)   Lap windings   (6 Marks)

(e) An 8 pole lap wound, 1200 conducers, with 0.003 wb per pole d.c motor runs at 500
rev/min. Find e.m.f generated for
(i)   A lap machine   (4 Marks)
(ii)   A wave machine   (3 Marks)

QUESTION TWO – (15 MARKS)

(a) State the material used to make cummulator brushes and one property of the same.

(3 Marks)

(b) A d.c shunt wound generator runs at a constant speed to generate a voltage of 150V at a certain value of field current. Find the change in generated voltage when the current is reduced by 20% ($\emptyset \infty I$).

(6 Marks)

(c) With aid of sketches show the following connections

    (i)   Series   (2 Marks)

    (ii)   Parallel   (2 Marks)

    (iii)   Compound connections for d.c motors   (2 Marks)

QUESTION THREE – (15 MARKS)

(a) Enumerate the significance of back e.m.f in d.c machines.   (4 Marks)

(b) Determine the terminal voltage of a d.c machines that develops and e.m.f of 200V with an armature current of 20A.   (4 Marks)

(c) Explain the nature of the following losses:

    (i)   Brush contact   (2 Marks)

    (ii)   Friction and windage losses   (2 Marks)

    (iii)   Iron losses   (2 Marks)

(d) State the expression for efficiency in a d.c motor.   (1 Mark)

QUESTION FOUR – (15 MARKS)

(a) With aid of appropriate diagram describe the d.c motor starter (a well labelled face plate starter).   (8 Marks)

(b) Describe the plugging method of speed control in d.c motors.   (7 Marks)

QUESTION FIVE – (15 MARKS)

A series motor runs at 800rev/min when the voltage is 400V and current is 25A. The armature resistance is 0.2Ω. Find the resistance to be connected in series to reduce the speed to 600rev/min with the same current.   (15 Marks)