MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

EED 311: MACHINES AND UTILIZATION II

DATE: 8/8/2016 **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS TO CANDIDATES:

Answer Question One and Any Other Two Questions

SECTION A- COMPULSORY QUESTION

1. a) With the aid of a diagram describe the construction and operation of an hysteresis motor (9 marks)

   b) Define the following with respect to electric traction
      i) Specific energy consumption
      ii) Co -efficient of Adhesion (4 marks)

   c) A Goods train weighing 300 tonnes is to be hauled by a locomotive up a gradient of 2%` with an acceleration of 1.0 mph/s, a coefficient of adhesion 20%, a track resistance of 45 newtonper tonne and the effective rotating masses is 10% of dead weight. If the axle load is not to exceed 20 tonnes determine the:
      i) Weight of the locomotive
      ii) Number of axles (6 marks)

d) Show with a labeled diagram the circulation cycle of a simple vapour compression

e) i) State three functions of a receiver - drier as a component of vapour compression refrigeration system (3 marks)

ii) State the three laws of thermodynamics with regard to refrigeration and air-conditioning systems. (3 marks)

iii) List any two properties of an ideal refrigerant suitable for a refrigeration system (2 marks)

SECTION B-ATTEMPT ANY TWO QUESTIONS

2. a) Describe with the aid of a diagram the construction and operation of a Single –phase synchronous reluctance motor. (10 marks)

b) State any three disadvantages of a diesel - electric traction system. (3 marks)

c) The magnetization characteristics of ad.c series motor at 600 rpm is given as follows;

Field current(A)	20	40	60	80	100
EMF(V)	50	100	125	140	150

Total resistance of armature circuit including field is 0.04Ω the motor is driving a hoist carrying a load of 32kg at radius of 45cm. Determine the resistance to be connected in motor circuit for applying Rheostatic braking to limit speed to 500 rpm (7 marks)

3. a) With the aid of a diagram explain the working of a thermostatic expansion valve (TXV) in refrigeration systems (6 marks)

b) Describe the following components of Refrigeration system
- An Evaporator
- A condenser (7 marks)

c) Explain the following types of collector gear for overhead equipment in electric traction systems

i) The trolley collector

ii) The pantograph collector (7 marks)

4. a) State any three advantages of an electric traction system as compared to steam traction system. (3 marks)

b) The distance between two stations is 1.6kms and the average speed of the train is 40km/hr. With an acceleration of 2km/h/s , a retardation during coasting of 0.16km/h/s and braking at 3.2km/h/s and assuming quadrilateral approximation of speed - time curve, determine the distance during

i) The acceleration period

ii) The braking period

iii) The coasting period (8 marks)

c) Describe with aid of a diagram the construction and operation of a variable reluctance stepper motor . (9 marks)

5. (a) (i) List any four main parts of a reciprocation compressor. (4 marks)

(ii) Explain with the aid of a diagram the principle of operation of a reciprocating compressor. (6 marks)

b) Describe with aid of a diagram the operation and construction of a universal motor (10 marks)