TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of Electrical and Electronic engineering

UNIVERSITY EXAMINATION:

Diploma in Electrical Power Engineering (DEPE 5)

ELECTRICAL MACHINES II
EEP 2301

END OF SEMESTER EXAMINATION

SERIES: MAY 2016

TIME: 2 HOURS

Question ONE

(a). (i) Define the per unit system of analysis   2marks
    (ii) State Four advantages of the per unit system   4marks

(b). A generator rated 1000 VA and 200V has internal impedance of j10 Ω. The generator impedance of j25 Ω% is stamped on the nameplate together with the other ratings. If the generator is short circuited at its terminals
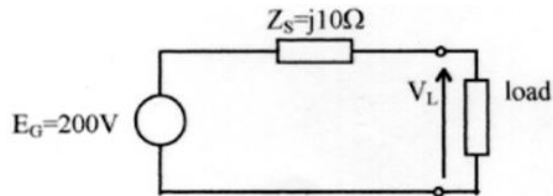
Determine;

    (i)   The short circuit current
    (ii)   Short circuit power delivered by the generator in p.u.,
          in percentage and in the actual units.   14marks

Question TWO

(a)   State the conditions to be satisfied inorder for three phase transformers to be operated in parallel.   (4 marks)

(b)   State the FOUR groups in which transformers are classified and state what determines the classification.   (8 marks)

(c)   A 400KVA transformer having 0.01 p.u. resistance and 0.05p.u. reactance is connected in parallel with 200KVA transformer 0.012p.u. resistance and 0.04p.u. reactance. Determine how they share a load of 600KVA at 0.8pf lagging.   (8 marks)

Question THREE

(a)   Explain the following:

          (i)   Hunting in synchronous motor
          (ii)   Causes of hunting
          (iii)   How hunting is countered
          (iv)   Pull out torque

                        (10 marks)

(b)   Explain the effect of adding load on a synchronous motor.   (5 marks)

(c)   Explain the lamps dark method of synchronizing.   (5 marks)

Question FOUR

(a) State;
   (i)   why a synchronous motor is refered to as a synchronous condenser
   (ii)   THREE advantages and THREE disadvantages of synchronous motors over static capacitors when used for power factor correction.
                                                                        (10 marks)

(b) A single phase source is connected to an electrical load. The load draws a 0.6 pu current at 1.10 pu voltage while taking a real power of 0.4 pu at a lagging power factor.
   Using a base voltage of 8 kV and a base current of 125 A. Calculate the following:
   (a) Real power in kW
   (b) Reactive power in kVAR
   (c) Power factor
   (d) Ohmic values of the resistance and reactance
   (e) The capacitor kVA rating required to improve the power factor to 0.9 lagging
                                                                        (10 marks)

Question FIVE

(a)   State TWO applications of the following:
   (i)   Stepper motor
   (ii)   Hysteresis motor
                                                                        (4 marks)

(b)   With reference to stepper motors explain:
   (i)   Holding torque
   (ii)   Step accuracy
                                                                        (4 marks)

(c)   A stepper motor has a step angle of 2.5° and a stepping frequency of 3600 pulses per second. Determine:

   (i)   Resolution
   (ii)   Number of steps required for the shaft to make 25 revolutions
   (iii)   Shaft speed
                                                                        (12 marks)