Bangladesh Army University of Science and Technology

Department of Computer Science and Engineering

Final Examination, Fall 2018 **Level-2 Term-I**
Course Code: EEE 2169 **Course Title: Electrical Drives and Instrumentation**
Time: 03 (Three) hours **Full Marks: 210**

N.B. (i) Answer any three questions from each PART (ii) Use separate answer script for each PART
(iii) Marks allotted are indicated in the margin (iv) All the symbols bear their usual meanings

PART A

1. a) What is electrical machine? What is the basic difference between motor and generator? 6

   b) What is critical resistance? Discuss the reasons why generator may fail to build up its voltage. 12

   c) What is series generator? Compare the terminal voltage characteristics of various DC generator in the same graph. 9

   d) A short-shunt compound generator deliver a load current of 30 A at 220 V, and has armature, series-field and shunt-field resistances of 0.05 Ω, 0.30 Ω and 200 Ω respectively. Calculate the induced e.m.f and the armature current. Allow 1.0 V per brush for contact drop. 8

2. a) What is transformer? Derive the e.m.f equation of transformer. 12

   b) Why hysteresis and eddy current losses occur in a transformer? How we can reduce these losses? Draw the equivalent circuit of a transformer with identifying all its parameter. 14

   c) A single phase transformer with a ratio of 440/110-V takes a no-load current of 5A at 0.2 power factor lagging. If the secondary supplies a current of 120A at a power factor of 0.8 lagging, estimate the current taken by the primary. 9

3. a) Why a primary current flows when secondary is loaded in case of transformer? Explain. 8

   b) What is synchronous generator? Draw the phasor diagrams of alternator at (i) unity pf (ii) lagging pf and (iii) leading pf. 12

   c) What are the conditions of parallel operations of two alternators? An alternator supply two load of 1000 KW at 0.8 pf and 800KW at 0.707 pf. The generator has no load frequency of 61 Hz and slope 1 MW/Hz. What is the operating frequency of system? 15

4. a) Explain why an induction Motor is called a rotating transformer. Discuss why does the rotor of induction motor rotates when stator is supplied. 12

   b) State All-day-efficiency. Find the all-day-efficiency of 500 KVA distribution transformer whose copper loss and iron loss at full load are 4.5 kW and 3.5 kW respectively. During a day of 24 hours, it is loaded as under: 13

No. of hours	Loading in kW	Power factor
6	400	0.8
10	300	0.75
4	100	0.8
4	0	0

   c) Prove that a rotating magnetic flux with constant magnitude is induced when the stator of induction motor is energized with two phase supply. 10

PART B

5. a) What are the basic differences between DC motor and AC motor? Discuss the principles of operation of DC motor. 15

   b) Draw the circuit diagram of short and long shunt DC motor. Why a DC series motor is not started without load? 12

   c) What is back emf? What are the significances of back emf in case of DC motor? 8

6. a) Why the 1Φ induction motor is not self-starting? Explain the starting methods of 1Φ induction motor. 15

   b) Why a motor is named induction motor? Derive the equation for starting torque of an induction motor and also derive the condition for maximum starting torque at standstill. 15

   c) What are the differences between a DC generator and alternator? 5

7. a) What is armature reaction? Write down the name of methods to reduce the armature reaction of DC generator. 10

   b) Why open circuit and short circuit test are done in transformer? Draw the circuit diagram for the open circuit test of transformer. Why measuring instruments are placed in low voltage side in case of open circuit test? 15

   c) Why rotor slots of induction motor are not exactly parallel? What are the differences between slip ring and squirrel case rotor? 10

8. a) What is slip of an induction motor? Discuss the procedure for starting a synchronous motor. 15

   b) Write down the comparisons between induction motor and synchronous motor. 10

   c) A 3Φ induction motor is wound for 4 poles and is supplied from 50 Hz system. Calculate the synchronous speed, the rotor speed when slip is 4%, rotor frequency when rotor runs at 600 rpm. 10