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Azara, Hatkhowapara,
Guwahati - 781017

Roll No. of candidate

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2019

B.Tech. 4th Semester End-Term Examination

Electrical Engineering

ELECTRO-TECHNOLOGY

(New Regulation)

(W.E.F 2017-2018)

Full Marks – 70

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Time – Three hours

The figures in the margin indicate full marks
for the questions.

Answer Question No. 1 and any *four* from the rest.

1. Choose the correct answer for the following
questions : (10 × 1 = 10)

(i) The dc motor which has a high starting
torque is

- (a) Dc shunt motor
- (b) Dc series motor
- (c) Dc compound motor
- (d) None of the above

[Turn over

- (ii) The revolving part of a dc machine is called
- (a) Armature
 - (b) Field system
 - (c) Commutator
 - (d) Yoke
- (iii) When the rotor is stationary, the slip of an induction motor is
- (a) 100%
 - (b) 0%
 - (c) 1%
 - (d) 75%
- (iv) A dc motor is still used in industrial applications because it
- (a) Is cheap
 - (b) Simple in construction
 - (c) Have lower losses
 - (d) Provides finer speed control
- (v) The speed of a synchronous machine having 12 poles and a supply frequency of 50 Hz is
- (a) 500 rpm
 - (b) 1000 rpm
 - (c) 1500 rpm
 - (d) 2000 rpm
- (vi) The starting torque of a 3-phase induction motor is _____ of supply voltage
- (a) Independent of
 - (b) Direct proportional to
 - (c) Direct proportional to square of
 - (d) Indirectly proportional to

- (vii) Open circuit characteristics of a dc generator is plotted between
- (a) No load e.m.f. and field current
 - (b) Generated e.m.f. and armature current
 - (c) Terminal voltage and load current
 - (d) None of the above
- (viii) The field circuit of a alternator is excited with
- (a) Alternating current
 - (b) Direct current
 - (c) Either Ac or Dc supply
 - (d) None of the above
- (ix) Synchronous impedance method of voltage regulation of an alternator is also known
- (a) E.m.f. method
 - (b) M.m.f. method
 - (c) Potier method
 - (d) None of the above
- (x) Auxiliary winding is introduced in a single phase induction motor to produce
- (a) Constant speed
 - (b) Revolving magnetic field
 - (c) Back e.m.f.
 - (d) Less losses

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2. (a) Discuss the various losses present in DC machine. (3)
- (b) Derive the condition for maximum efficiency in a DC machine. (3)
- (c) Define the cross magnetizing and Dc magnetizing effect of a dc machine due to armature reaction. (4)
- (d) A DC shunt generator supplies 96 A at a terminal voltage of 220 V. The armature and shunt field resistance are 0.1Ω and 50Ω respectively. The iron and frictional losses are 2500W. Find (i) e.m.f. generated (ii) total copper loss (iii) commercial efficiency. (5)
3. (a) Draw and explain the speed-torque characteristic of a dc shunt motor and de series motor. (5)
- (b) A 220 V dc shunt motor at no load takes a current of 2.5 A. The resistances of the armature and shunt field are 0.8 Ohms and 200 Ohms. Estimate the efficiency of the motor when the input current is 32 amperes. (5)
- (c) A 6-pole lap wound DC generator has 600 conductors on its armature. The flux per pole is 0.02 Wb. Calculate the speed at which the generator must run to generate 300V. (3)
- (d) How can you make a single phase induction motor self starting? (2)

4. (a) Explain why an induction motor is called generalized transformer. (2)
- (b) Draw and explain the slip torque characteristic of three phase induction motor. (5)
- (c) How does a 3-phase supply produce a rotating field of constant magnitude in 3-phase induction motor? (4)
- (d) A 10 pole 3 phase alternator is coupled to an engine running at 600 r.p.m. It supplies to a 3 phase induction motor which has full load speed of 1400 r.p.m. Calculate the number of poles and slip of the motor. (4)
5. (a) State the condition for paralleling alternator with infinite bus. (4)
- (b) Derive the expression for the induced e.m.f. for an alternator. Why are alternators rated in kVA. (5)
- (c) A 3300 kV, 3 phase star connected alternator has a full load current of 100A. On short circuit, a field current of 5A is necessary to produce full load current. The e.m.f. on open circuit for the same excitation is 900 V; the armature resistance is 0.8 Ohms. Find the full load voltage regulation at 0.8 p.f. lagging. (6)

6. (a) What is hunting? How can it be removed? (3)
- (b) Explain the construction and working principle of any one type of single phase induction motors. (4)
- (c) The Hopkinson's test on two identical shunt machines gave the following results.

Input voltage = 500V

Output current of the generator = 120A

Field current of the motor = 3A

Input current = 15A

Field current of the generator = 4A

Armature resistance of each machine = 0.06 Ohm

Find the efficiency of motor and generator. (8)

7. Write short notes on the following (any *three*):

(3 × 5 = 15)

- (a) Communication process.
- (b) Methods of speed control of a three phase induction motor.
- (c) Brushless DC motor.
- (d) AC servomotor
- (e) Double field revolving theory in a single phase induction motor.

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