



KC-6163

B. E. II (Sem. III) (EC/IC/CO) Examination
November/December – 2012
Electrical Machines

Time : 3 Hours]

[Total Marks : 100

Instructions :

(1)

नीचे दृष्टावेक निशानीवाणी विगतो उत्तरवडी पर अवश्य लपवी.
Fillup strictly the details of signs on your answer book.

Name of the Examination :
B. E. II (Sem. III) (EC/IC/CO)

Name of the Subject :
Electrical Machines

Subject Code No. : **6 1 6 3** Section No. (1, 2,.....): **1&2**

Seat No. :

Student's Signature

- (2) Attempt all questions.
(3) Assume appropriate data and give neat sketches wherever necessary.
(4) Numerical figure to the right indicate full marks.

SECTION – I

- 1 (a) Fill the blanks : 6
- (i) In a DC generator the direction of induced emf can be found by applying _____ rule.
(ii) A 220v dc shunt motor having armature resistance of 1Ω , takes armature current of 10 A will develop the back emf of _____ V.
(iii) In core type transformer _____ surrounds a considerable part of _____.
(iv) In a D.C. generator, AC induced emf is converted to DC with the help of _____.
(v) A single phase transformer with $K = 10$ and secondary rating of 1000 V, number of primary turns = _____, if emf per turn is 10 V.
(vi) A step up transformer in creases _____.
- (b) Match the following List I and List II : 4
- | | |
|---------------------|-----------------------------|
| List I | List II |
| (i) Transformer | (a) Full load |
| (ii) DC generator | (b) No load |
| (iii) Swinburn Test | (c) Dynamically induced emf |
| (iv) S.C. Test | (d) Mutually induced emf |

- (c) Explain star delta and delta star transformer connections. 5
- (d) State the reasons which cause the terminal voltage under load condition to be different from the terminal voltage under no load condition for (i) separately excited generator (ii) shunt generator. 5
- 2 (a) Draw and explain characteristics of DC series and shunt motors. 6
- (b) A shunt generator supplies a load at 230 V. The load takes a power of 30 kW. Resistance of armature winding is 0.05 ohms and that of the field winding is 115 ohms. The voltage drop due to brush contacts is 1 V/brush. Calculate induced e.m.f. in the generator. 6

OR

- 2 (a) Prove the condition for maximum efficiency of the transformer. 4
- (b) A 2500/250V, 50Hz single phase transformer has the following test results : 8
 O.C. test : (L.V. side) : 250 V, 1.4A, 105 W,
 S.C. test : (H.V. side): 104 V, 8A, 320 W
 Determine equivalent circuit constants.
- 3 Attempt any three : 18
- (a) Explain equivalent circuit of a single phase transformer.
- (b) Explain the no load and loading operation of transformer with phasor diagram.
- (c) Explain the speed control methods for DC shunt and series motors.
- (d) Write a brief note on auto transformer.
- (e) Derive the emf and torque equation of the DC Machine.

SECTION – II

- 4 (a) Do as directed : 5
- (i) The flux induced in 3-phase induction motor have constant magnitude and is rotate at synchronous speed. (True,false)
- (ii) The frequency of rotor current and stator current are same at starting. (true, false)

- (iii) The frequency of rotor current of 4 pole, 50 hz induction motor is _____ when running at 750 rpm.
- (iv) The field is a rotating part of alternator. (true, false)
- (v) Synchronous motor only runs at synchronous speed. (true, false)
- (b) Explain no-load and blocked rotor test of 3-phase induction motor. 5
- (c) Explain speed torque characteristics of induction motor. 6
- (d) A 6-pole, 3-phase induction motor operates from a supply whose frequency is 60 Hz. Calculate :
- (i) the speed at which the magnetic field of the stator is rotating.
- (ii) the speed of the rotor current when the slip is 0.04.
- (iii) the frequency of the rotor currents when the slip is 0.03.
- (iv) the frequency of the rotor currents at standstill.
- 5 (a) Write the short note on armature reaction of an alternator. 8
- (b) From the following test results, determine the voltage regulation of a 2000 V, 1-phase alternator delivering a current of 100A at (i) unity power factor (ii) 0.8 leading power factor and (iii) 0.71 lagging power factor. 7
- Test results : full load current of 100A is produced on short-circuit by a field excitation of 2.5A. An e.m.f. of 500V is produced on open-circuit by the same excitation. The armature resistance is 0.8 ohm.
- OR**
- 5 (a) Explain the production of rotating magnetic flux in the stator of 3-phase induction motor with vector diagram at different angles. 8
- (b) A 3-phase 400/200V star-star connected wound rotor induction motor has 0.06 ohm rotor resistance and 0.3 ohm standstill reactance per phase. Find the additional resistance required in the rotor circuit to make the starting torque equal to the maximum torque of the motor. 7

6 Write any three :

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- (i) Explain starting of synchronous motor.
 - (ii) Derive the equation for starting torque for 3-phase induction motor.
 - (iii) Derive the condition for maximum torque under running condition for 3-phase induction motor.
 - (iv) Name and explain the different types of rotor used in 3-phase induction motor.
 - (v) Write short note on repulsion motors.
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