



UF-6163

B. E. - II (Sem. - III) (EC/IC/CO) Examination

May/June - 2012

Electrical Machines

Time : Hours]

[Total Marks :

Instructions :

(1)

नीचे दर्शायेव निशानीवाणी विगतो उत्तरवही पर अवश्य कपवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="text" value="B. E. - II (Sem. - III) (EC/IC/CO)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="Electrical Machines"/>	<input type="text"/>
Subject Code No. : <input type="text" value="6"/> <input type="text" value="1"/> <input type="text" value="6"/> <input type="text" value="3"/>	<input type="text"/>
Section No. (1, 2,...): <input type="text" value="1,2"/>	<input type="text"/>
	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 in the blanks : 6
- (i) Open circuit test on transformer gives _____ losses.
- (ii) Efficiency of ideal transformer is always _____ at any load.
- (iii) While conducting short circuit test of a transformer _____ side is short circuited.
- (iv) In a D.C. machine _____ and _____ combination makes mechanical rectifier.
- (v) Value of transformation ratio K is _____ than unity for step down transformer.
- (b) Answer in brief : (any **three**) 9
- (i) Why transformer rating is in VA ?
- (ii) What is the armature reaction ?
- (iii) Write advantages and applications of auto transformer.

- (iv) Draw the N-T characteristic and T-Ia characteristic for DC series motor.
 - (v) Draw the load characteristic of separately excited generator and DC shunt generator.
 - (c) Explain star delta and delta star transformer connections. **5**
- 2**
- (a) Explain the construction of a single phase transformer. **5**
 - (b) Explain the working of a 1-phase transformer. Also derive its E.M.F. equation. **5**
 - (c) A single phase transformer has 500 turns in the primary and 1200 turns in the secondary. The cross sectional area of the core is 80 sq. cm. If the primary winding is connected to a 50 Hz supply at 500 V. Calculate (1) Peak flux density and (2) Voltage induced in the secondary. **5**

OR

- (a) Derive EMF equation for DC machines. **5**
 - (b) Derive torque equation of DC machines. **5**
 - (c) A 25 KVA single phase transformer has 250 turns on the primary and 40 turns on the secondary winding. The primary is connected to 1500 volt, 50 Hz mains. Calculate (1) Primary and secondary currents on full load, (2) Secondary e.m.f. (3) Maximum flux in the core. **5**
- 3** Attempt any **three** : **15**
- (a) Explain the speed control of DC Machine.
 - (b) Explain the construction and connection of three phase transformer.
 - (c) 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.
 - (d) A 60H.P. 1100 V DC series motor has armature winding resistance of 0.18 ohm and series winding resistance of 0.13 ohm. The rated current is 45 A at 450 rpm. Determine the motor current at 1200 rpm. What will be the speed when motor current is 50 A ? Neglect saturation.
 - (e) Explain the no load and short circuit test of the transformer.

Section - II

- 4 (a) Do as directed : 5
- (i) At the starting of induction motor, the slip = _____. (0, 1)
 - (ii) The frequency of rotor current and stator current are same under running condition. (True, False)
 - (iii) The slip of 6 pole, 50 Hz induction motor is _____ when running at 750 rpm.
 - (iv) Zero power factor method of an alternator is used to find its _____. (efficiency, voltage regulation)
 - (v) The starting torque of 3-phase induction motor increases with increment in rotor resistance. (True, False)
- (b) Derive equation for induced emf in alternator. 5
- (c) Explain speed torque characteristics of induction motor. 6
- (d) A 4-pole, 3-phase induction motor operates from a supply whose frequency is 50 Hz. Calculate : (1) the speed at which the magnetic field of the stator is rotating. (2) the speed of the rotor current when the slip is 0.04. (3) the frequency of the rotor currents when the slip is 0.03. (4) the frequency of the rotor currents at standstill. 4
- 5 (a) Explain the production of rotating magnetic flux in the stator of 2-phase induction motor with vector diagram at different angles. 8
- (b) A 50 Hz, 8-pole induction motor has full load slip of 4%. The rotor resistance/phase=0.01 ohm and standstill reactance/phase=0.1 ohm. Find the ratio of maximum to full-load torque and the speed at which the maximum torque occurs. 7

OR

- 5 (a) Write the synchronous impedance method to find voltage regulation of an alternator. 8
- (b) A 60-KVA, 220V, 50Hz, 1-phase alternator has effective armature resistance of 0.016 ohm and an armature leakage reactance of 0.07 ohm. Compute the voltage induced in the armature when the alternator is delivering rated current at a load power factor of (a) unity (b) 0.7 lagging & (c) 0.7 leading. 7

- 6** Write any **three** : **15**
- (i) Explain slip in induction motor and derive equation for the frequency of rotor current.
 - (ii) Derive the equation for running torque for 3-phase induction motor.
 - (iii) Derive the condition for maximum torque at starting for 3-phase induction motor.
 - (iv) Write different power stages of 3-phase induction motor.
 - (v) Write short note on universal motor.
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