



**RM-6563**

**B. E. II (Sem. IV) Examination**

**May / June - 2010**

**Electrical Technology**

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.	Seat No. :
Name of the Examination :	<input type="text"/>
<b>B. E. - 2 (Sem. 4)</b>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<b>Electrical Technology</b>	<input type="text"/>
Subject Code No. : <input type="text"/> 6 <input type="text"/> 5 <input type="text"/> 6 <input type="text"/> 3	Section No. (1, 2,.....): <input type="text"/> 1&2
Student's Signature	

- (2) All questions are **compulsory**.
- (3) Write both sections in **separate** answer books.
- (4) Figures to the right indicate full marks.
- (5) Assume suitable data and draw figures wherever necessary.
- (6) Scientific calculator up to Casio-Superfx100D, 100W, 100MS series and equivalent are permitted.

**SECTION - I**

- 1 (a) Fill in the blanks. 6
- (i) In a d.c. generator the direction of induced emf can be found by applying \_\_\_\_\_ rule.
  - (ii) Commutator facilitates collection of \_\_\_\_\_ from the armature conductors.
  - (iii) In dc shunt motor field winding is connected in \_\_\_\_\_ with the armature winding.
  - (iv) Value of transformation ratio K is \_\_\_\_\_ than unity for step down transformer.
  - (v) Transformer rating are usually expressed in terms of \_\_\_\_\_.
  - (vi) Transformer core is laminated to reduce \_\_\_\_\_ losses.

- (b) Match the following list-I and list II. 4
- | List I     | List II                  |
|------------|--------------------------|
| O.C. Test  | Mechanical to electrical |
| Commutator | Core loss                |
| D.C. Motor | Cu loss                  |
| S.C. Test  | Converts AC to DC.       |
- (c) (i) Explain the construction of D.C. machine and state the function of each part. 6
- (ii) Derive the emf equation of an IQ transformer. 4
- 2** (a) Explain the basic principle of a d.c. motor and derive the torque equations for the same. 8
- (b) A 4 pole, lap wound 750 rpm dc shunt generator has an armature resistance of  $0.4\ \Omega$ , and field resistance of  $200\ \Omega$ . The armature has 720 conductors and flux per pole is 30 mwb. If load resistance is  $15\ \Omega$ , determine the terminal voltage. 7
- OR**
- 2** (a) Compare auto transformer with ordinary transformer. Prove that the same capacity and voltage ratio auto transformer requires less copper than an ordinary transformer. 7
- (b) The open circuit and short circuit tests on a 10 KVA, 125/250V, 50 Hz single phase transformer gave the following results : 8
- O.C. test : 125 V, 0.6 A, 50 W (L.V. side)
- S.C. test : 15 V, 30 A, 100 W (H.V. side)
- Calculate :
- (i) Copper loss on full load
- (ii) Full load efficiency at 0.8 leading p.f.
- (iii) Regulation at full load, 0.9 leading p.f.
- 3** Attempt any **three** : 15
- (a) Three point starter (Write short note)
- (b) Explain D.C. series motor characteristics.
- (c) Explain the magnetic leakage of transformer. Also state how we can consider the magnetic leakage by representing inductive coils connected in primary and secondary circuits.

- (d) For a single phase transformer having primary and secondary turns 440 and 880 respectively, determine the transformer kVA rating, if half load secondary current is 7.5 A and maximum value of core flux is 2.25 mW.

## SECTION - II

- 4 (a) Fill in the blanks : 10
- (i) In a synchronous generator, the \_\_\_\_\_ is always a stationary member and the \_\_\_\_\_ moving member.
  - (ii) The speed of 3-phase induction motor operation in its stable region \_\_\_\_\_ with increase in load torque.
  - (iii) A 4-pole, 3-phase, 50 Hz induction motor on full load runs at 1440 rpm, the slip speed is \_\_\_\_\_.
  - (iv) For a given load the armature current of a synchronous motor will be minimum for \_\_\_\_\_ power factor.
  - (v) Slip of induction motor during blocked rotor test is \_\_\_\_\_.
  - (vi) The distribution factor for a 36 slot stator with three phase, 8-pole winding, having 120 degree phase spread is \_\_\_\_\_.
  - (vii) The maximum torque that a synchronous motor can develop without loss of synchronism is known as \_\_\_\_\_ torque.
  - (viii) If a squirrel-cage rotor is replaced by a solid cylinder in an induction motor its no-load slip will \_\_\_\_\_.
  - (ix) The efficiency of synchronous motor is \_\_\_\_\_ than that of an induction motor of same size and output rating.
  - (x) Synchronous reactance can be defined as sum of \_\_\_\_\_ and \_\_\_\_\_ reactance.
- (b) Explain the construction of 3-phase alternator with neat sketches. 5
- (c) Explain with the neat sketch, constructions and working of star-delta starter use for 3-phase induction motor. 5

- 5 (a) Discuss effect of variation in field excitation of synchronous motor with constant load. 3
- (b) A 400 V, 3-phase 50 Hz, star-connected induction motor has the following test results : 12
- No load test : 400 V 8.5 A 1100 W
- Blocked rotor Test : 180 V 45 A 5799 W
- Calculate the line current and power factor when operating at 4% slip. The stator resistance per phase is 0.5 ohm.
- OR**
- 5 (a) What is armature reaction? Explain the effect of armature reaction on the terminal voltage of an alternator at (i) unity power factor load (ii) zero leading power factor load. Draw the relevant phasor diagrams. 7
- (b) A 3-phase, star connected, 1000 kVA, 11000 V alternator has rated current of 52.5 A. The acv resistance of the winding per phase is 0.45 ohm. The test results are given below: 5
- OC Test : Field current = 12.5 A, Voltage between lines = 422 V
- SC Test : Field current = 12.5 A, line current = 52.5A
- Determine the full-load voltage regulation of the alternator (a) 0.8 pf lagging and (b) 0.8 pf leading.
- 6 Attempt any **three** : 15
- (i) Universal motor.
- (ii) ZPF method to find out regulation of alternator.
- (iii) Derive condition for maximum torque in 3-phase induction motor.
- (iv) Speed control of 3-phase squirrel cage induction motor.
- (v) Principle of operation of synchronous motor.
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