



**SE-6205**

**B. E. II (Sem. III) (Elect.) Examination**

**April / May – 2011**

**Electrical Machine - I**

Time : 3 Hours]

[Total Marks : 100

**Instructions :**

(1)

नीचे दशांशिक निशानीवाणी विगतो उत्तरवही पर अवश्य कभवी. 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. 2 (Sem. 3) (Elect.)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="Electrical Machine - 1"/>	<input type="text"/>
Subject Code No. : <input type="text" value="6"/> <input type="text" value="2"/> <input type="text" value="0"/> <input type="text" value="5"/>	<input type="text" value="Student's Signature"/>
Section No. (1, 2,.....) : <input type="text" value="1&amp;2"/>	

- (2) All questions are compulsory.
- (3) Draw figures wherever necessary and make necessary assumptions wherever required.
- (4) Figures to the right indicate full marks.

**SECTION - I**

- 1 (a) Fill in the blanks : 06
- (1) In a compound machine the resistance of shunt field is \_\_\_\_\_ than the resistance of series field.
  - (2) In a dc machine \_\_\_\_\_ carries the magnetic flux produced by the field poles.
  - (3) A dc generator develops the emf of 220 V at the speed of 1000 rpm. Assuming linear magnetic circuit, it develops the emf of \_\_\_\_\_ V when runs at constant speed, and flux is reduced to 50 %.
  - (4) Direction of rotation of DC shunt motor can be changed by changing the polarity of field winding.  
(True or False)

- (5) Back emf of DC motor increases with the increase in speed of rotation. (True or False)
- (6) Interpoles are used in DC machine to minimize the effect of commutation. (True or False)
- (b) Match the following List I and List II : **04**
- | List I             | List II                |
|--------------------|------------------------|
| (1) Back emf       | (a) DC series motor    |
| (2) Yoke           | (b) Speed governor     |
| (3) Varying flux   | (c) Magnetic flux path |
| (4) Constant speed | (d) DC shunt motor     |
- (c) List the parts of DC machine. Explain the working principle of DC generator and show how commutator converts AC induced emf into DC. **06**
- 2** (a) Discuss about the necessity of starter. Explain the construction and working for 3-point starters used for DC shunt motor. **08**
- (b) A short shunt compound generator delivers a load current of 30 A at 220 V, and has armature, series field and shunt field resistances of  $0.05\ \Omega$ ,  $0.30\ \Omega$  and  $200\ \Omega$  respectively. Calculate : **08**
- (a) Induced emf
  - (b) Armature current
  - (c) Power developed by the armature.
- OR**
- (a) Explain the phenomenon of armature reaction. Also state the effects of it on to the main field. **08**
- (b) A long shunt compound generator delivers a load current of 50 A at 500 V and has armature, series field and shunt field resistances of  $0.05\ \Omega$ ,  $0.03\ \Omega$  and  $250\ \Omega$  respectively. Calculate the generated voltage and armature current. Allow 1 V per brush for contact drop. Also find power developed by armature. **08**

- 3** Attempt any three of the following : **18**
- Prove that the flux inside the transformer core is independent of load.
  - Explain the armature reaction in DC machines.
  - Derive step by step equivalent circuit of a 1- $\phi$  transformer.
  - Explain the open circuit and short circuit test of a transformer.
  - State the essential conditions for voltage build up of a DC generator.

### SECTION - II

- 4** (a) Answer in short : (each of two marks). **10**
- What is a principle of operation of transformer ?
  - What will happen if primary of a transformer is connected to D.C. supply ?
  - Which losses can be measured from the no-load test on 1-ph transformer ? Why ?
  - Why auto transformer is not safe for supplying a low voltage from a high voltage source ?
  - What are the advantages of 3-ph transformer over 3 single-ph transformer ?
- (b) Explain theory of ideal transformer and draw phasor diagram of practical transformer operating on full load for unity, lagging and leading power factor. **10**
- 5** (a) State the losses of transformer. What do you mean by efficiency in case of transformer ? Derive the condition for maximum efficiency in a transformer. **08**
- (b) Consider a 4-kVA, 200/400 V single - phase transformer supplying full load current at 0.8 lagging power factor. The O.C./S.C. test results are as follows. **07**
- |             |        |       |       |              |
|-------------|--------|-------|-------|--------------|
| O.C. test : | 200 V. | 0.8 A | 70 W. | (I.V. side.) |
| S.C. test : | 20 V   | 10 A  | 60 W. | (h.v. side)  |
- Calculate efficiency, secondary voltage and current into primary at the above load.

**OR**

(a) Define voltage regulation and derive equation for voltage regulation of single phase transformer at unity, lagging and leading power factor. **08**

(b) A 250/500 V transformer gave following test results : **07**  
S.C. test : 20 V.      12 A      100 W.  
O.C. test : 250 V      1 A      80 W. on I.v. side  
Determine the circuit constant and draw equivalent circuit.

**6** Answer any three : **15**

- (1) Write a short note : construction of 1-ph transformer.
- (2) Short note : Auto transformer.
- (3) Explain V-V connection.
- (4) Discuss conditions to be satisfied for the parallel operation of two 1-phase transformer.
- (5) Draw standard connection with showing angular displacement for 3-ph transformer.

---