(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2539 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VI) THEORY EXAMINATION 2011-12

ELECTRICAL MACHINES

Time : 2 Hours *Total Marks : 50*

Note :—(1) Answer ***all*** questions.

(2) All the questions carry equal marks.

1. Attempt any ***two*** parts of the following :— **(7×2=14)**

   (a) Describe the constructional features of the following electrical rotating machines :—

      (i) Induction Machine

      (ii) D.C. Machine.

   (b) Explain the basic operation of the following machines :—

      (i) Synchronous Machine

      (ii) D.C. Machine.

   (c) Explain the matching characteristics of electric machines and loads.

2. Attempt any ***two*** parts of the following :— **(6×2=12)**

   (a) Derive the generalised equations of generated emf and torque developed in D.C. Machines.

(b) A 220 V compound generator, the armature, series and shunt windings have resistances of 0.25 Ω, 0.15 Ω and 50 Ω, respectively. The load consists of 100 lamps, each rated at 60 W, 220 V. Find the total emf and armature current when the machine is connected for :

(i) long shunt and

(ii) short shunt.

(c) Explain the basic fundamental of D.C. motor starting. Also, explain the four-point starter for D.C. shunt motor.

Attempt any *two* parts of the following :— **(6×2=12)**

(a) Explain the magnetomotive force (mmf) method of determining the voltage regulation of an alternator.

(b) A 3300 V, star-connected synchronous motor has synchronous impedance of (0.4 + j5) Ω per phase. For an excitation e.m.f. of 4000 V and motor input power of 1000 kW at rated voltage, compute the line current and power factor.

(c) Explain the following :—

(i) parallel operation of synchronous generators

(ii) hunting in synchronous machines.

Attempt any *two* parts of the following :— **(6×2=12)**

(a) Discuss torque-slip characteristic for an induction machine by establishing an expression between torque and slip.

(b) For a 3-phase induction motor, maximum torque is two times of the full load torque and starting torque is 1.6 times of the full load torque. In order to get a full load slip of 5%, calculate the percentage reduction in rotor circuit resistance. Neglect stator impedance.

(c) Explain the construction and operation of single phase induction motor.

(d) Explain the constructional features and operating principle of stepper motor.