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Reg. No................................

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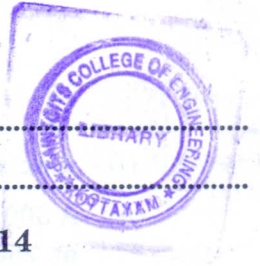
B.TECH. DEGREE EXAMINATION, NOVEMBER 2014

Third Semester

Branch : Electronics and Communication/Electronics and Instrumentation/Applied Electronics and Instrumentation Engineering

ELECTRICAL TECHNOLOGY (LAS)

(Prior to 2010 Admissions—Old Scheme)

[Supplementary/Mercy Chance]

Time : Three Hours   Maximum : 100 Marks

Part A

Answer all questions briefly.
Each question carries 4 marks.

1. Explain the function of commutator in a dc generator.

2. What are the reasons for drop of terminal voltage of a dc shunt generator when loaded ?

3. What is the necessity of a starter for a d.c. motor ? Why small motors can be switched directly ?

4. Explain the significance of back e.m.f. in the operation of a dc motor under loaded condition.

5. Derive an e.m.f. equation for a single phase transformer and deduce expression for transformation ratio.

6. List the advantages and applications of an autotransformer.

7. Explain any one method of starting of a synchronous motor.

8. Draw and explain torque-slip characteristics of a 3-phase induction motor.

9. Explain the constructional features of a servo motor.

10. What are the types of AC conductors ? Explain.

(10 × 4 = 40 marks)

Part B

Answer either A or B of each questions.
Each full question carries 12 marks.

11.   A (i)   Explain the critical field resistance of a dc shunt generator.   (4 marks)

(ii)   For a 200V, long shunt compound generator, the resistance of the armature, shunt field and series windings are 0.06 Ω, 25 Ω and 0.04 Ω respectively. When a load of 20 kW at 200V is connected across its terminals, calculate the induced voltage.

(8 marks)

Or

Turn over
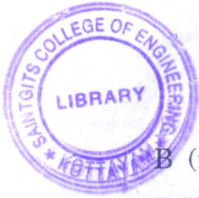
B (i) A dc. generator fails to self excite at rated speed. Why ? (4 marks)

(ii) A 500 V, 10 pole d.c. shunt generator supplies a load of 500 kW at rated voltage and runs at 750 r.p.m.. The shunt field resistance is 500 Ω and armature resistance is 0.01 Ω. Calculate the armature current and induced voltage.

(8 marks)

12. A (i) Explain how torque is produced in a d.c. motor. (4 marks)

(ii) A 250 V shunt motor takes a total current on full load and 5A on no-load. If the no-load speed is 1000 r.p.m. What is the speed at full load ? Ra = 0.3 Ω, Rsh = 250 Ω.

(8 marks)

Or

B (i) Explain the applications of d.c. series motors. (4 marks)

(ii) A d.c. series motor, connected to 440 V supply runs at 600 r.p.m., when taking a current of 50A. Calculate the value of the resistor which when inserted in series with the motor, will reduce the speed to 400 r.p.m., with the gross torque being then half of its previous value. Resistance of the motor is 0.2 Ω. Assume the flux to be proportional to the field current.

(8 marks)

13. A (i) Define efficiency of a transformer. Derive an expression for maximum efficiency of a transformer.

(4 marks)

(ii) A 200 V/400V transformer $r_1 = 0.2$ Ω, $x_1 = 0.5$ Ω, $r_2 = 0.75$ and $x_2 = 2$ Ω. Find the secondary terminal voltage when supplying 10A at 0.8 pf lag.

(8 marks)

Or

B) (i) Explain how the primary responds to a secondary load current. Draw and explain the phasor diagram if the transformer supplying a leading pf load.

(8 marks)

(ii) A 4 KVA, 200/400V, 50 Hz transformer draws a current of 2A at a pf of 0.2. What is the primary current when the secondary is connected to a load that draws full load current at 0.8 pf lag.

(4 marks)

14. A (i) What are the advantages of housing excitation for an alternator on rotor ? Explain. (4 marks)

(ii) A 3 phase, 500V, induction motor has a stator impedance of $0.062 + j 0.22$ Ω. The equivalent rotor impedance at stand still is the same. The magnetising current is 3.5 A, the core loss is 1500 W, and the mechanical loss is 750 W. Estimate the output, efficiency and power factor at a ship of 2%.

(8 marks)

Or

(b) (i) Show that the maximum torque developed by an induction motor is independent of rotor resistance.

(4 marks)

(ii) Describe e.m.f. method of obtaining regulation of an alternator for lagging and leading power factor load.

(8 marks)

15.   A   With neat figures, explain the constructional details, working and applications of stepper motor.

Or

B   Describe the construction, working and applications of tachogenerators.

(5 × 12 = 60 marks)