D 10037 (Pages : 3) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2010

AN/ME 09 305—ELECTRICAL TECHNOLOGY

(2009 admissions)

Time : Three Hours Maximum : 70 Marks

Part A

1. When a generator loses its residual magnetism either due to lighting or short circuit. How can it be made to build up ?
2. Explain how armature reaction occurs in a d.c. generator and the effect it has on the flux distribution of the machine ?
3. Why transformer rating in KVA ?
4. How would you reverse the direction of rotation of a capacitor start induction run motor ?
5. Define the term duty cycle in DC-DC Converters.

(5 × 2 = 10 marks)

Part B

6. A 100KW, 500V shunt excited generator delivers full load. The generated e.m.f. is 525 V. If the field resistance is 200 ohms. Calculate (a) the armature resistance and (b) the induced e.m.f. for a load of 60 kw at 520 V.
7. Give the construction features and explain the working principle of a single-phase auto transformer.
8. A moving coil instrument has a resistance of 150 ohms and a full scale deflection of 10 mA. Find the value of the shunt to convert into a multi range ammeter to read upto (a) 5A (b) 10 A.
9. Explain the torque speed characteristics of a three-phase slip ring induction motor.
10. A 3-phase, 10 pole, 600 r.p.m. alternator is star connected and has 320 conductors per phase. The flux per pole is 60 mwb. if the distribution factor is 0.96 and pitch factor is 0.98, find the phase and line voltages.
11. Draw the speed-torque characteristics of DC motor drives.

(4 × 5 = 20 marks)

Turn over

Part C

12. (a) (i) An eight-pole generator has a lap. Connected armature with 640 Conductors. The ratio of pole arc per pole pitch is 0.7. Calculate the ampere - turns per pole of a compensating winding to give uniform air-gap density when the total armature current is 900 A.

(3 marks)

(ii) Explain why a d.c. shunt wound motor needs a starter on Constant Voltage mains.

A shunt-wound motor has a field resistance of 350Ω and an armature resistance of 0.2 Ω and runs off 250 V supply. The armature current is 55 A and the motor speed is 1000 r.p.m. Assuming a straight-line magnetization curve, Calculate : (a) the additional resistance required in the field circuit to increase the speed to 1100 r.p.m. for the same armature current ; (b) the speed with the original field current and an armature current of 100 A.

(7 marks)

Or

(b) (i) Describe swinburne test on a shunt motor and give the steps for calculating the efficiency of a motor from the results of the test.

(5 marks)

(ii) Explain the principle of operation of DC Generator.

(5 marks)

13. (a) A 100KVA transformer has 400 turns on the primary and 80 turns on the secondary the primary and secondary resistances are 0.3 Ω and 0.01 Ω respectively, and the corresponding leakage reactances are 1.1 Ω and 0.035 Ω respectively. The supply voltage is 2200 V. Calculate (i) the equivalent impedance referred to the primary circuit. (ii) The voltage regulation and the secondary terminal voltage for full load having a power factor of (1) 0.8 lagging and (2) 0.8 leading. Calculate the per unit and the percentage resistance and leakage reactance drops of the transformer.

(10 marks)

Or

(b) Explain the working of a single-phase induction type energy meter with a neat sketch.

(10 marks)

14. (a) Develop an equivalent circuit of an induction motor from first principle.

(10 marks)

Or

(b) Two similar three-phase star-connected generators are connected in parallel. Each machine has a synchronous reactance of 4.5Ω/ph and negligible resistance and is excited to generate an e.m.f. of 1910V/ph the machines have a phase displacement of 30 electrical degrees relative to each other. Calculate (i) the circulating current, (ii) the terminal Voltage/Phase ; (iii) the active power supplied from one machine to the other. Sketch the phasor diagram for one phase.

(10 marks)

15. (a) Explain the different methods of solid state speed control of three-phase induction motor.

(10 marks)

Or

(b) (i) Explain the field control methods used for DC series motor for speed control.

(5 marks)

(ii) Discuss the transfer, output and switching characteristics of power MOSFET.

(5 marks)