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NEW SCHEME

Fifth Semester B.E. Degree Examination, July 2007
Electrical and Electronics Engineering

D.C. Machines and Synchronous Machines

Time: 3 hrs.]

[Max. Marks:100

Note : Answer any FIVE full questions.

- 1
 - a. Discuss the significance of critical field resistance. Explain the method to determine the critical field resistance. (05 Marks)
 - b. Explain the need for an interpole and how the polarities are chosen for generator and motor respectively. (05 Marks)
 - c. What is armature reaction in D.C. machine? Explain how armature reaction produces cross magnetization and de-magnetization effect. Derive an expression for the same. (10 Marks)

- 2
 - a. Develop typical characteristics of shunt and series D.C. motor and explain their suitability to typical applications. (12 Marks)
 - b. With the help of a neat diagram explain the Ward-Leonard method of speed control. (08 Marks)

- 3
 - a. Discuss in detail the Swinburn test conducted on D.C. machine for predetermination of efficiency. (10 Marks)
 - b. A retardation test is carried out on a 1000 rpm D.C. machine. The time taken for the speed to fall from 1030 rpm to 970 rpm is:
 - i) 36 seconds with no excitation.
 - ii) 15 seconds with full excitation.
 - iii) 9 seconds with full excitation and armature supporting on extra load of 10 A at 219 V. Calculate:
 - I) The moment of inertia of the armature in kg-m^2 .
 - II) Iron loss.
 - III) Mechanical loss at the mean speed of 1000 rpm. (10 Marks)

- 4
 - a. What is pitch factor and distribution factor? Explain. Derive an expression for emf induced in an alternator including the effect of pitch factor and distribution factor. (10 Marks)
 - b. A 3 Φ , 50 Hz, 10 pole alternator has 90 slots. The flux per pole is 0.15 web. If the winding is to be star connected to produce a line voltage of 11000 volts, find the number of armature conductors to be connected in series / phase. (10 Marks)

- 5
 - a. Discuss the merits and demerits of M.M.F. method over EMF method to calculate percentage voltage regulation of a synchronous generator. Briefly explain the ASA method of finding regulation. (12 Marks)
 - b. A 600 V, 60 kVA, single-phase alternator has an effective resistance of 0.2 Ω . A field current of 10 A, produces an armature current of 210 A on short circuit and an emf of 480 V on open circuit. Calculate:
 - i) Synchronous impedance and reactance.
 - ii) Regulation with 0.8 p.f. lagging, unity and 0.6 p.f. leading. (08 Marks)

Contd.... 2

- 6 a. With the help of relevant phaser diagram explain the operation of a 3Φ cylindrical rotor alternator under constant load with variable excitation. (10 Marks)
- b. Explain the phenomena of hunting in synchronous machine and remedies to avoid it. (10 Marks)
- 7 a. What is reluctance power? Explain. Derive an expression for the power output of a salient pole synchronous generator. (10 Marks)
- b. What is the necessity for parallel operation of alternators? Discuss the requirement for parallel operation. (10 Marks)
- 8 Write short notes on any four:
- a. Starting of synchronous motor
 - b. Capability curves of synchronous generator
 - c. Hopkinsons test
 - d. V and \wedge curves of synchronous motor
 - e. Permanent magnet DC motor. (20 Marks)
