BTS.V.11.14. 0855 Reg. No. | | | | | | | | | D

B.Tech. Degree V Semester Examination November 2014

EE 1502 ELECTRICAL MACHINES II
(2012 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A
(Answer *ALL* questions)

(8 × 5 = 40)

I. (a) Derive the relation between the number of poles, the frequency and speed of the alternator.
(b) What are the causes of harmonics in an alternator and how these can be reduced?
(c) Explain the effects of armature reaction in alternators for all power factors.
(d) What is synchronization? Explain the necessity of synchronization.
(e) Explain V-curves and inverted V-curves.
(f) What is synchronous condenser?
(g) Explain hunting in synchronous motors.
(h) Define transient and subtransient reactance.

PART B

(4 × 15 = 60)

II. (a) State the advantage of using a stationary armature and rotating field system in alternator. (7)
(b) What are the different types of armature windings commonly employed in alternators? (8)

OR

III. Calculate the rms value of the induced e.m.f. per phase of a 10 pole, 3-phase, 50H_z alternator with 2 slots per pole per phase and 4 conductors per slot in two layers. The coil span is 150°. The flux per pole has fundamental component of 0.12 Wb and a 20% third component. (15)

IV. (a) Explain synchronous impedance of an alternator. (5)
(b) A 1200kVa, 3300V, 50 Hz, 3 phase, star connected alternator has armature resistance of 0.25 Ω per phase. A field current of 40A produces a short circuit current of 200A and an open circuit emf of 1100V line-to-line. Find the voltage regulation on (i) full load 0.8pf lagging (ii) full load 0.8 pf leading. (10)

OR

V. (a) Explain the slip test on alternator. (7)
(b) Find the voltage regulation by zero power factor method of 15,000kVa, 11,000V, 3-phase, 50 Hz, star connected alternator at full load, 0.8 pf lagging having the following test data: (8)

Field AT in 10^3	10	18	24	30	40	45	50
O.C.line voltage (KV)	4.9	8.4	10.1	11.5	12.8	13.3	13.65
Line volts, zero p.f (KV)	--	0	--	--	--	10.2	--

(P.T.O.)

VI. (a) Explain the starting methods of a synchronous motor. (7)

(b) The synchronous reactance per phase of a 3-phase, star-connected, 6600V, synchronous motor is $10\,\Omega$. For a certain load, the input is 900Kw and the induced emf is 8900V (line value). Find the line current and power factor. Neglect resistance. (8)

OR

VII. (a) Explain the operation of a synchronous motor under constant excitation and varying load. (7)

(b) Derive the expression for maximum power developed in a synchronous machine connected to infinite busbar. (8)

VIII. (a) Explain in detail the power angle curve of a salient pole synchronous machine. (10)

(b) Explain the functions of damper windings in a synchronous motor. (5)

OR

IX. (a) Obtain an expression for the natural frequency of undamped oscillation of the rotor of a synchronous motor. (8)

(b) A 10,000kVa, 4 pole, 6600V, 50Hz, 3 phase, star connected alternator has a synchronous reactance of 25% and operates on constant voltage, constant frequency bus-bars. If the natural period of oscillation while operating at full load and unity p.f is to be limited to 1.5 seconds, calculate the moment of inertia of the rotating system. (7)

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