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325555(25)

B. E. (Fifth Semester) Examination, April-May, 2018

(New Scheme)

(EEE Branch)

ELECTRICAL MACHINES-II

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) is compulsory from each question. Attempt any two parts (b), (c) and (d).*

1. (a) What are the advantages of providing a field winding on rotor and armature winding on the stator. 2

(b) A 4 pole, 3ϕ, 50 Hz. Y-connected alternator has 60 slot, with two conductor per slot, having armature winding of double layer type. Coils are short pitched in such a way that if one coil side lies in slot no. 1 and other coil side lies in slot no. 13. Determine flux per pole required to generate line voltage of 6000V? 7

(c) 3ϕ, Y-connected synchronous generator rated at 10 kVA, 230 V has an armature resistance of 0·5 Ω/ phase and synchronous reactance of 1·2 Ω/phase calculate voltage regulation at full load at P.F. of :

(i) 0·8 lagging

(ii) 0·8 leading

(iii) Determine the p.f. such that the voltage regulation is zero on full load. 7

(d) Write short notes on : (any two) 7

(i) SCR

(ii) Armature reaction on alternator

(iii) Measurement of Z_s and X_s

(iv) Potier triangle

2. (a) What is meant by alternator on infinite bus-bar. 2

(b) With necessary condition of parallel operation. Describe the prime mover characteristics of an alternator to operate successfully in parallel and also derive the expression for power shared by two alternator using frequency load characteristics. 7

(c) Explain, with phasor diagram. How synchrounus machine control the power factor. 7

(d) Derive the expression for active power I/P and O/P for cylindrical rotor machine and also explain the condition of max. power I/P and O/P. 7

3. (a) Explain, why cylindrical rotor synchronous generator is called turbo alternator and salient pole synchonous generator is called hydro generator. 2

(b) Describe laboratory method to measure X_d and X_q of synchronous machine. 7

(c) Explain power angle characteristics of salient pole machine and also show that per phase reactive power in terms of power angle δ and for lagging p.f. is given by : 7

$$Q = \frac{E_f V_t}{X_d}\cos\delta - \frac{V_t^2}{X_d} - V_t^2\left[\frac{1}{X_q} - \frac{1}{X_d}\right]\sin^2\delta$$

(d) What is stiffness of coupling? Show that salient pole synchronous machine is more stiffer than cylindrical rotor machine. 7

4. (a) Why 3ϕ induction motor is called asynchronous motor. 2

(b) Justify that with star-delta starter, a motor behaves as if it were started by an auto transformer starter with $x = 0{\cdot}58$ tapping. 7

(c) A 3ϕ, 4 pole 50 Hz. 400 V induction motor takes the power I/P of 35 kW at its full load speed of 980 rpm. The total stator losses are 1 kW and friction and windage losses are 1·5 kW.

Calculate : 7

(i) Slip

(ii) Rotor Ohmic Loss

(iii) Shaft power

(iv) Shaft torque

(v) Efficiency

(d) A $3-\phi$ 50 Hz 4 pole induction motor has rated O/P of 10 kW at 1425 rpm and max. torque is developed at 1200 rpm. Calculate starting torque neglect stator resistance and rotational losses. 7

5. (a) Why $1-\phi$ induction motor is not self starting. 2

(b) Explain effect of Harmonic Induction torque and Harmonic synchronous torque in $3-\phi$ induction motor. 7

(c) Explain double revolving field theory for $1-\phi$ induction motors. 7

(d) Write short notes on : 7

(i) Deep bar rotor

(ii) Double cage induction motor

(iii) Starting methods of $1-\phi$ induction motors