

B.Tech. SEM -IV Electrical 2014 Course (CBCS) : SUMMER - 2019
SUBJECT: ELECTRICAL MACHINES-II

Day: Saturday
Date: 25/05/2019

S-2019-2608

Time: 10.00 AM TO 01.00 PM
Max Marks: 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use non-programmable calculator is **allowed**.

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- Q.1** a) With suitable diagrams explain Blondel's two reaction theory of salient pole alternator. (04)
- b) Derive emf equation of three phase alternator. Describe significance of all the terms in the equation. (06)

OR

- Q.1** a) Write down power equation and draw power – power angle curve of synchronous alternator (04)
- b) A 36 slot, 6 pole, 3 phase, 50 Hz alternator has winding with coil span of 5 slots with two conductor per slot. Calculate pitch factor and distribution factor. (06)

- Q.2** a) A 2000 kVA, 3 phase, 8 pole alternator runs at 750 rpm in parallel with other machine on 600 V bus bars. Find synchronizing power on full load 0.8 power factor lagging per mechanical degree of displacement and corresponding synchronizing torque. the synchronous reactance is 6 Ω /Phase. (06)
- b) Describe load sharing of alternators using load versus frequency characteristics. (04)

OR

- Q.2** a) An 11kV, 3 phase, star connected synchronous generator delivers 4000 kVA at upf when running on constant voltage, constant frequency bus bars. If the excitation is raised by 20%, determine kVA and power factor at which machine now works. The steam supply is constant. $X_s = 30 \Omega$ /phase. Neglect power losses and assume magnetic circuit to be unsaturated. (06)
- b) Define synchronous impedance. Sketch vector diagram at 0.8 power factor lagging to determine no load emf and write down equation to calculate E_{ph} . (04)

- Q.3** a) Explain briefly 'V' curves and inverted 'V' curves of three phase synchronous motor. (04)
- b) A three phase, 10kW synchronous motor is connected to 1000 V supply and has synchronous reactance of 10 Ω per phase. Find the value of minimum current and the corresponding induced emf for full load condition. The efficiency of the motor is 80%. Neglect armature resistance. (06)

OR

- Q.3** a) Compare performance of three phase synchronous motor with three phase induction motor. (04)
- b) A 3000 V, 3 phase synchronous motor running at 1500 rpm has its excitation kept constant corresponding to no load terminal voltage of 3000V. Determine the power input, power factor, and torque developed for an armature current of 250A, if the synchronous reactance is 5 ohm per phase. Neglect armature resistance. (06)

P.T.O.

- Q.4 a)** Determine the slip at maximum torque and ratio of maximum to full load torque for a three phase star connected , 6.6 kV, 20 pole , 50 Hz induction motor .Its rotor resistance is 0.12Ω and standstill reactance is 1.12Ω per phase. The motor runs at 292.5 rpm at full load. (05)
- b)** Draw torque-slip characteristics of induction motor and describe various regions of the characteristics .What is the effect of rotor resistance on torque slip characteristics. (05)

OR

- Q.4 a)** The rotor resistance and reactance per phase of a 415 V, 4 pole, 50 Hz, 3 phase induction motor is 0.024Ω and 0.12Ω respectively. Find the speed at maximum torque. Also find maximum torque in Newton-Meter. Consider ratio of stator turns to rotor turns as 1. (06)
- b)** Derive the condition of maximum torque and write down equation for maximum torque. (04)

- Q.5** A 5 kW, 400 V, 4 pole, 50Hz , delta connected motor gave the following results (10)
 $R_1 = 1.6 \Omega/\text{phase}$

	Voltage (volts)	Current (amp)	Power (watts)
No load test	400	3.1	350
Blocked Rotor test	52	7.6	440

Draw circle diagram to the scale and determine full load efficiency.

OR

- Q.5 a)** Draw neat diagram of Direct On Line(DOL)starter and describe principle of operation. (06)
- b)** Draw neat diagram of load test on three phase induction motor. What is the effect of load on slip and power factor of induction motor. (04)
- Q.6 a)** Describe construction and principle of operation of hysteresis motor. (04)
- b)** Describe construction and principle of operation of Linear induction motor. (06)

OR

- Q.6 a)** Describe construction and principle of operation of reluctance motor. (04)
- Q.6 b)** Describe operation of induction generator with torque speed characteristics (06)

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