B.Tech. SEM -IV Electrical 2014 Course (CBCS) : WINTER - 2018

SUBJECT: EIECTRICAL MACHINES - II

Day: Wednesday | **W-2018-2343** | Time: 02.30 PM TO 05.30 PM

Date: 14/11/2018 | 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**.

Q.1 **a)** Compare salient pole type construction with non salient pole type construction of three phase alternator **(04)**

b) Effective resistance of a 1200 kVA, 3300 V, 50Hz, three phase star connected alternator is 0.3Ω per phase. A field current of 35 A produces a current of 200 A on short circuit and 1100 V across line on open circuit . Find per unit change in terminal voltage when full load of 1200kW at 0.8 power factor lagging is thrown off. **(06)**

OR

Q.1 **a)** Define voltage regulation of alternator .Draw the equivalent circuit of alternator **(04)**

b) Draw neat diagram and describe procedure to perform slip test .How Xd and Xq are determined from this test? **(06)**

Q.2 **a)** An alternator has direct axis reactance 0.9 per unit and quadrature axis reactance of 0.55 per unit. Find per unit open circuit voltage for full load at 0.8 power factor lagging. **(04)**

b) With neat diagram and describe one dark, two bright lamp method of synchronization of three phase alternator. **(06)**

OR

Q.2 **a)** Define short circuit ratio of alternator .Elaborate its significance **(04)**

b) Slip test is conducted on three phase , 3 kVA, 415 V, star connected alternator with following observations **(06)**

V_{max} (line) volt	V_{min}(line) volt	I_{max} Amp	I_{min} Amp
44.3	39.9	1.1	0.8

The armature resistance per phase is 5 ohm. Calculate regulation of alternator at 0.8 power factor lagging.

Q.3 **a)** Explain principle of operation of synchronous motor with neat sketch. **(04)**

b) Describe effect of variable excitation at constant load on performance of synchronous motor. Draw necessary graphs. **(06)**

OR

Q.3 **a)** Explain hunting phenomenon in synchronous machine. Why is it objectionable? How can it be reduced? **(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)** Describe principle of operation of three phase induction motor **(04)**

b) A 3.3 kV, 20 pole, 50Hz,3phase star connected induction motor has a slip ring rotor of resistance 0.025 ohm per phase and standstill reactance of 0.28 ohm per phase. The motor runs at 294 rpm when full load torque is applied. Calculate **(06)**

i) Slip at maximum torque.
ii) The ratio of maximum to full load torque
iii) The ratio of starting torque to full load torque

OR

Q.4 **a)** Draw power flow diagram of three phase induction motor and derive relationship between rotor copper loss, rotor input and gross mechanical power developed. **(04)**

b) A 6pole,440V,3phase,50Hz induction motor has the following parameters of its equivalent circuit referred to stator **(06)**

$R_1 = 0\Omega$, $R_2' = 0.3\Omega$, $X_1 = 0.7\Omega$, $X_2' = 0.7\Omega$, $X_m = 35\Omega$,

Rotational loss = 750watts

Calculate net mechanical power output, stator current and power factor when motor runs at 950 rpm.

Q. 5 A 15 kW, 415 V, 4 pole, 50Hz , delta connected motor gave the following results **(10)**

	Voltage (volts)	Current (amp)	Power (watts)
No load test	415	10.5	1510
Blocked Rotor test	105	28	2040

Draw circle diagram and determine full load efficiency and full load slip. Assume stator and rotor copper losses are equal at standstill.

OR

Q.5 **a)** Draw diagram of star – delta starter and describe principle of operation with relationship of starting torque and full load torque **(06)**

b) Describe phenomenon of crawling in induction motor. **(04)**

Q.6 **a)** What are the modifications required in the design of DC series motor, if it is connected to AC supply voltage? Describe in detail. **(04)**

b) Describe construction and principle of operation of linear induction motor **(06)**

OR

Q.6 **a)** Describe operation of induction generator with torque speed characteristics. **(06)**

b) What are the advantages of permanent magnet synchronous motor over synchronous motor? Describe its applications. **(04)**

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