Q.P. Code: 16EE220 **R16**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

BTECH III Year I Semester Regular & Supplementary Examinations Nov/Dec 2019

ELECTRICAL MACHINES III

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1 **a** Explain the different types of armature windings. **7M**

b Derive the no-load voltage expression of a cylindrical pole alternator using phasor diagrams. **5M**

OR

2 **a** Derive the generalized expression for an induced e.m.f per phase in three phase alternator, when coils are not full pitch and concentrated in one slot. **7M**

b A 3-phase, 20-pole, 360 rpm, star connected alternator has a double-layer winding arranged in 180 slots. There are 6-conductors per slot. Find the emf induced per phase, if the flux per pole is 0.042 Wb. The coils are short-chorded by one slot. **5M**

UNIT-II

3 **a** Explain how X_d and X_q of a salient pole alternator can be found experimentally. **7M**

b A 3-phase star connected alternator is rated at 1600 kVA, 13500 V. The per phase armature effective resistance and synchronous reactance are 1.5 Ohm and 30 Ohm, respectively. Calculate the percentage regulation for a load of 1280 kW at power factor of 0.8 leading. **5M**

OR

4 The OC and sc test results for a 3-ph 50Hz,1000kVA ,2000V,Y-connected alternator are as follows **12M**

I_f	10	20	25	30	40	50
V_{oc}	800	1500	1760	2000	2350	2600
I_{sc}	---	200	250	300	---	---

The effective armature resistance per phase is 0.5 ohm. Estimate the full load percentage regulation using mmf method at 0.707 p.f. lagging and 0.8 p.f. leading.

UNIT-III

5 **a** What is meant by synchronization? Explain the way of synchronizing an alternator to the infinite bus bars. **7M**

b The EMFs of two alternators are $3000\angle 20^0$ V and $2900\angle 0^0$ V. Their synchronous impedances are (2 + j20) Ω/phase and (2.5 + j30) Ω/phase. The load impedance is (10 + j4) Ω/phase. Find the circulating current. **5M**

OR

6 **a** Derive the expression for load sharing between dissimilar alternators. **7M**

b Two 3-phase alternators are working in parallel with the following particulars: **5M**

Alternator 1: Z_1 = (0.2+j2) ohms/phase; E_1 = (2000+j0) V/phase
Alternator 2: Z_2 = (0.2+j2) ohms/phase; E_2 = (2200+j100) V/phase

Load: Z_L = (3+j4) ohms/phase. Determine the kW output and power factor of each alternator.

UNIT-IV

7	**a**	Derive the expression for power developed by the synchronous motor.	**7M**
	b	Draw the phasor diagrams of synchronous motor for unity, leading and lagging power factor conditions.	**5M**
		OR	
8	**a**	List and explain the Starting methods for synchronous motor.	**7M**
	b	A sub-station operating at full load of 1200 kVA supplies a load at 0.7 power factor lagging. Calculate the rating of synchronous condenser to raise the substation power factor to 0.9 lagging.	**5M**

UNIT-V

9	**a**	Describe double revolving field theory as applied to single phase induction motor.	**7M**
	b	Explain the principle of operation of reluctance motor.	**5M**
		OR	
10	**a**	Discuss the principle of operation of AC series motor and also list its applications.	**7M**
	b	Why single phase induction motors are not self-starting? How it can be started?	**5M**

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