TED (15/19) 6033
(Revision-2015/19)

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, APRIL - 2024

SYNCHRONOUS MACHINES AND FHP MOTORS

[Maximum marks: 100] [Time: 3 Hours]

PART – A
Maximum marks: 10

I. (Answer ***all*** the questions in one or two sentences. Each question carries **2** marks)

1. Define distribution factor.
2. Define voltage regulation of alternator.
3. Name any two methods to synchronize two alternators.
4. List any two starting methods of synchronous motor.
5. List any four FHP motors. (5 x 2 = 10)

PART – B
Maximum marks: 30

II. (Answer any ***five*** of the following questions. Each question carries **6** marks)

1. Explain the advantages of stationary armature over rotating armature in a synchronous generator.
2. Describe the effect of armature reaction under purely capacitive load in alternators.
3. Explain the necessary conditions for parallel operation of single phase and three phase alternators.
4. Explain different losses in alternators.
5. Explain **V** curve of synchronous motor.
6. List the application of synchronous motors.
7. Explain the working of a servo motor with the help of block diagram. (5 x 6= 30)

PART – C
Maximum marks: 60

(Answer ***one full*** question from each unit**.** Each full question carries **15** marks)

UNIT – I

III. (a) Explain the construction of synchronous generator with neat figures. (8)

(b) A 3-phase, 16-pole alternator has a star-connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 Wb, Sinusoidally distributed and the speed is 375 r.p.m. Find the frequency rpm and the phase and line e.m.f. Assume full-pitched coil. (7)

OR

IV. (a) Derive the equation for generated EMF in synchronous generators. (8)

(b) Calculate the no-load phase voltage and line voltage of a star-connected 3-phase, 6-pole alternator which runs at 1200 rpm, having flux per pole of 0.1 Wb sinusoidally distributed. Its stator has 54 slots having double layer winding. Each coil has 8 turns and the coil is chorded by 1 slot. (7)

UNIT - II

V. (a) Explain short circuit test on alternator with neat circuit diagram and short circuit characteristics. (8)

(b) A 1000 KVA, 3300 V, 3-phase star connected alternator has armature resistance and synchronous reactance of 0.5 ohm per phase and 5 ohm per phase respectively. Calculate the voltage regulation when the alternator is delivering rated current at 0.8 pf lagging and 0.8 pf leading. (7)

OR

VI. (a) Explain EMF method to find voltage regulation of alternator. (8)

(b) A 3.5-MVA, Y-connected alternator rated at 4160 volts at 50-Hz has the open circuit characteristic given by the following data:

Field Current (Amps)	50	100	150	200	250	300	350	400	450
E.M.F line voltage (Volts)	1620	3150	4160	4750	5130	5370	5550	5650	5750

A field current of 200 A is found necessary to circulate full-load current on short-circuit of the alternator. Calculate the full load voltage regulation at 0.8 p.f. lagging by **Ampere-Turn method**. Neglect resistance. (7)

UNIT - III

VII. (a) Explain **inverted V** curve of synchronous motor. (8)

(b) Illustrate the effect of change in excitation on armature current and power factor of synchronous motor with help of vector diagrams. (7)

OR

VIII. (a) Explain the construction of synchronous motor. (8)

(b) Describe any three starting methods used in synchronous motors. (7)

UNIT – IV

IX. (a) Explain the construction and working principle of repulsion type motors. (8)

(b) Explain the construction and working of switched reluctance motors. (7)

OR

X. (a) Explain the working principle of permanent capacitor type single phase induction motor with the help of circuit diagram and vector diagram. (8)

(b) Explain the construction and working of universal motors. (7)
