1T00835 - T.E.(Electiral Engineering)(SEM-V)(Choice Base Credit Grading System) (R-20-21) (C Scheme) / 32021 - Electrical AC Machines II
QP CODE: 10012854 DATE: 22/11/2022

3 Hours **Max. Marks:80**

NB:
Question 1 is compulsory
Attempt any three from question No.2 to Question No.6
Assumptions made should be clearly stated

Number to the right side indicate Marks

Q1 – Answer any four Questions.

a. List the needs and advantages of modelling electrical machines. (5)
b. Derive the output power equation of synchronous generator. (5)
c. Explain the needs for parallel operation of alternators. (5)
d. Explain hunting in synchronous motors. (5)
e. Explain measurement of Xd and Xq by slip test. (5)
f. Derive equation for pitch factor (Kp). (5)

Q2 (a)Explain armature reaction in synchronous alternator for different power factor loads. 10

(b) Calculate the RMS value of the induced EMF per phase of a 10 pole 3 phase 50 Hz alternator with 2 slots per pole per phase and 4 conductors per slot in two layers coil span is 150 degree the flux per pole is 0. 12 Wb. 10

Q3 (a)Define regulation and hence explain Zero Power Factor (ZPF) used to calculate regulation. 10

(b)3 phase star connected 1000 kVA, 2000 V, 50 Hz, star connected alternator, gave following test results,

Field current (A)	10	20	25	30	40	50
OC voltage (V)	800	1500	1760	2000	2350	2600
ZPF voltage (V)	-	200	250	300	-	0

Armature effective resistance per phase is 0.2 Ω. Draw characteristic curves and find the regulation at 0.8 power factor lagging and leading by MMF method. 10

Q4 (a) What is the need for parallel operation? Explain the effect of changing mechanical torque (prime mover input) on parallel operation of two alternators connected in parallel. 10

(b)Two station generators A and B operate in parallel. Station capacity of A is 50 MW and of B is 25 MW. Full load speed regulation of station A is 50 MW and of B is 25 MW. Full load speed regulation of station A is 3 % and B is 3.5 %. Calculate the load sharing if connected load is 50 MW, no load frequency is 50 Hz. 10

Q5 (a)Explain Blondel's two reaction theory in detail. 10

(b) 3300 kVA, 3 phase star connected, 6600 V, 8 pole, 50 Hz cylindrical alternator has synchronous reactance of 20% and it is running parallel with infinite bus. Calculate synchronizing power and corresponding synchronizing torque per mechanical degree of phase displacement at

1. No load 2. Full load 0.8 power factor (lagging). 10

Q6.(a)With necessary phasor diagrams explain V and Inverted-V curves of synchronous motor. 10

(b)3 phase, 40 kW, 400 V, 50 Hz, Star connected synchronous motor has full load efficiency of 90%. The synchronous impedance of the motor is 0.25+ j12 per phase. If the excitation of the motor is adjusted to give leading power factor of 0.8. Calculate the induced emf and total mechanical power developed at full load. 10