

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.TECH MIDSEM EXAMINATION
7th SEMESTER
ACY-2022-23 (ODD SEM)

Subject: AC Machine & Transmission Line Design (203106439)

Branch: Electrical

Date: 04/08/2022

Time: 10:30 am to 12:00 pm

Total Marks: 40

Sr. No.	Marks
Q.1 (A) One Line Questions	
(i) Mention any two properties of conductor material used for transmission of power in overhead transmission line.	
(ii) State any two advantages of high transmission voltage.	05
(iii) What is the disadvantage of using higher value of flux density in air gap?	
(iv) Define total magnetic loading.	
(v) What is the use of damper winding in synchronous motor?	
(B)	
Determine Inductance per phase per metre and Capacitance per phase per metre of three phase transmission line considering following data:	
Power = 85,000 kW, Power factor = 0.90 lag, Distance = 160 km., Voltage = 166kV, spacing between conductors = 8.0 m, resistance / km = 0.21 Ω per phase, Outer radius = 0.827 cm, Self GMD = 0.768 R, considering ACSR conductor is used for transmitting power.	05
Q.2 Attempt any four (Short Questions)	12
(1) Spacing of conductors depends on which factors?	
(2) For which purpose insulators are used? List out various types of insulators used in transmission line with their allowable voltage range.	
(3) Write a note on surge impedance loading of transmission line.	
(4) Define SCR and specific electrical loading with necessary equations.	
(5) Define pole pitch, slot pitch and runaway speed.	
Q.3 Attempt any two	08
(1) Write a short note on Corona.	
(2) Discuss factors affecting choice of specific magnetic loading in synchronous alternator.	
(3) Determine the main dimensions for a 1000 kVA, 50 Hz, 3 phase, 375 rpm alternator. The average air gap flux density is 0.55 Wb / m ² , ampere conductors per metre are 28,000. Consider ratio of core length to pole pitch as 2 and winding factor of 0.955.	
Q.4 (A) Derive $Q = CoD^2Ln$, for three phase synchronous machine.	05
(B) Determine a suitable number of slots and conductors per slot, for the stator winding of a 3 phase 3300 V, 50 Hz, 300 rpm alternator. The diameter is 2.3 m and the axial length of core is 0.35 m. The maximum flux density in air gap should be approximately 0.9 Wb / m ² . Assume sinusoidal flux distribution. Use single layer winding and star connection for stator.	05

OR

(B) A 1250 kVA, 3 phase, 50 Hz, 300 rpm, synchronous generator with a concentric winding has the following design data:

Specific magnetic loading = $B_{av} = 0.58 \text{ Wbl m}^{-2}$

Specific electrical loading = $a_c = 33000 \text{ Aim}$

Air gap length = 5.5 mm

SCR = 1.2

Peripheral speed is 30 *m/s*. Find stator core length, stator bore, turns per phase, armature mmf per pole and field mmf per pole at no load. Consider winding factor as 0.955.

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