

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.Tech. Summer 2018 - 19 Examination**

**Semester: 8**  
**Subject Code: 03106453**  
**Subject Name: AC Machine & Transmission Line Design**

**Date: 01/05/2019**  
**Time: 10:30 am to 01:00 pm**  
**Total Marks: 60**

**Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1 Objective Type Questions - (All are compulsory) (Each of one mark) (15)**

1. In induction motor, if length of air gap has been increased, then the power factor will be\_\_\_\_\_.
2. Practically, MMF of damper winding in synchronous machine is \_\_\_\_\_. [Specify in terms of specific electric loading (ac) and pole pitch ( $\tau$ )]
3. For elimination of nth harmonic by skewing, the electrical angle of skewing is \_\_\_\_\_.
4. The ratio of magnetizing current and ideal short circuit current is called \_\_\_\_\_.
5. \_\_\_\_\_ conductors are commonly used for high voltage transmission line.
6. The value of current density in rotor bar of squirrel cage induction motor is in between
 

(a) 1 to 2 $A/mm^2$	(b) 10 to 14 $A/mm^2$
(c) 4 to 7 $A/mm^2$	(d) None of the above
7. For salient pole hydro electric synchronous generator, SCR varies from
 

(a) 0.5 to 0.7	(b) 1.0 to 1.5
(c) Both (a) and (b)	(d) None of the above
8. The purpose of damper winding in synchronous generator is
 

(a) To suppress the negative sequence field	(b) both (a) and (c)
(c) To damp the oscillation when machine starts hunting	(d) None of the above
9. For squirrel cage rotor, the rotor slots are
 

(a) Closed	(b) Semi-closed
(c) both (a) and (b)	(d) None of the above
10. Short Circuit Ratio of synchronous machine is
 

(a) $\frac{1}{X_d}$	(b) $\frac{AT_{fo}}{AT_a}$
(c) both (a) and (b)	(d) None of the above
11. Define leakage coefficient.
12. Write the relationship between kVA rating and horse power rating of 3- $\phi$  induction motor.
13. Define peripheral speed.
14. Define Run away speed.
15. Define overload capacity.

**Q.2 Answer the following questions. (Attempt any three)**

**(15)**

- A) Explain equivalent spacing of the conductors in transmission line.
- B) Derive SCR and discuss its importance in the design and performance of synchronous Machine.
- C) State rules for selection of rotor slots of 3- $\phi$  Induction Motor
- D) Explain design difference between low speed and high speed machine.

**Q.3** A) Derive the output equation of induction machine  $Q = C_0 D^2 L n_s$ . Symbols have their usual meaning. **(07)**

B) A 1250 kVA, 3 phase, 50Hz, 3300 V, 300 rpm, synchronous generator with concentric winding has the following data: **(08)**

Specific magnetic loading = 0.58 wb / m<sup>2</sup>.

Specific electrical loading = 33000 A/m.

Air gap length = 5.5mm

Field turns per pole = 60

SCR = 1.2

The effective gap area is 0.6 times the actual area. Peripheral speed is 30 m/s. Find the stator core length, stator bore, turns per phase, mmf for airgap, armature mmf per pole and field current for no load and rated voltage. (assume star connection)

**OR**

B) 11 kW, 3- $\phi$ , 6-pole, 50 Hz, 220 volt, star connected induction motor has 54 stator slots, each containing 9 conductors. Calculate the value of bar and end ring currents. The number of rotor bars is 64. The machine has an efficiency of 86% and power factor of 0.85 lag at full load. Find the bar and end ring sections if the current density is 5 A/mm<sup>2</sup>. **(08)**

**Q.4** A) Explain the importance of the following factors in design of transmission line. (any **Two**) **(07)**

- (i) Surge Impedance Loading
- (ii) Corona Loss
- (iii) String Efficiency
- (iv) Sag

**OR**

A) Explain the factors affecting the selection of air gap of three phase induction motor. **(07)**

B) Analyse the importance of harmonic induction torque and harmonic synchronous torque on design of induction motor. **(08)**