

**B.Tech 5th Semester (EE)****Dec, 2021****COMPUTER AIDED ELECTRICAL MACHINES  
DESIGN***Time allowed : 3 hours]**[Maximum marks :75]*

*Note : Attempt five questions in all selecting one from each Section. Question No.1 is compulsory.*

1. (a) What are the limitations in electrical machine design ?
  - (b) What do you understand by specific electric and magnetic loading ?
  - (c) What is the transformer yoke designed for low flux density ?
  - (d) Compare leakage flux and leakage reactance.
  - (e) What do you understand by coil span and pole pitch ?
- 4×5=20

**Section -A**

2. The temperature rise of a transformer is 25°C after one hour and 37.5°C after two hours of starting from cold conditions. Calculate its final steady temperature rise and the heating time constant. If its temperature

falls from the final steady value to 40°C in 1.5 hours when disconnected, calculate its cooling time constant. The ambient temperature is 30°C. 20

3. Describe an output equation of a.c. machine and discuss various factors affecting size of rotating machines. 20

### Section-B

4. (a) Explain real and apparent flux densities. 10  
 (b) Derive an expression for a specific permeance of a magnetic circuit in electrical machine. Define leakage permeance. 10
5. Deduce an expression for the mmf required for the air gap of an armature with slots and ducts. 20

### Section-C

6. Explain the detailed design of Induction motor. 20
7. (a) Draw and explain the winding diagram for a 4 poles, 36 slots, 3-phase mush concentrated armature. 10  
 (b) Design a 250 KVA, 2000/400 V, 50Hz, 1-Phase, Core type, oil immersed, self cooled, power transformer with the following data :

Induced E.M.F. per turn = 15V

Max. flux density in the core = 1.25 Wb/m<sup>2</sup>

Current density = 2.75 A/mm<sup>2</sup>

Window space factor = 0.3

Window proportions  $\frac{\text{Height}}{\text{Width}} = 3$

Determine the main dimensions of the core and yoke. 1

### Section-D

8. (a) Discuss the advantages of computer aided machine design. 1  
 (b) Write a computer programme to design an armature of a d.c. motor. 1
9. (a) Discuss general procedure for optimization. 1  
 (b) Write short notes on : 1  
 (i) Analysis method  
 (ii) Synthesis method.