



R18 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

Subject code: 2E5BA

B.TechV Semester Regular Examinations, February 2021

ELECTRICAL MACHINE DESIGN

(Electrical And Electronics Engineering)

Maximum Marks: 70

Date: 24.02.2021 Duration: 3 hours

- Note:**
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks

(10x2M=20 Marks)

- 1 What is specific electric loading
- 2 What are the major Considerations in Machine design
- 3 Why is transformer yoke designed for low flux density
- 4 Distinguish between core type & shell type transformer.
- 5 List the undesirable effects produced by certain combination of stator & rotor.
- 6 What are the methods adopted to reduce the harmonics?
- 7 List the factors to be considered for separation of D&L for salient pole machine
- 8 Write the expression for air gap length in cylindrical rotor machine.
- 9 Explain the merits of using digital computers for Machine design
- 10 Name few softwares used for designing Electrical machines

Part-B

Answer All the following questions.

(10M X 5=50Marks)

- 11 a) Discuss about the factor that influence the choice of specific electrical and magnetic loading in the design. (5M)
b) What do you understand by Continuous, short time, Short time Intermittent rating of machines. (5M)

OR

- 12 a) What are the main classification of electrical materials. (5M)
b) Describe the properties and application of those materials. (5M)
- 13 a) A 250 KVA, 6600V/400V 50HZ single phase transformer has total losses of 4800W at full load. The transformer tank is 1.25m in height and 1x0.5m in plan. Design a suitable scheme for tubes if the average temperature rise is to be limited to 35 Celsius. The diameter of tubes is 50mm and are spaced 75mm from each other. The average height of tubes is 1.05m. Specific heat dissipation due to radiation & convection is respectively 6 & 6.5 W/m²/°C. Assume that the convection is improved by 35% due to provision of tubes. (5M)

- b) Derive the expression for number of cooling tubes to design in transformer. (5M)

OR

- 14 a) Calculate the KVA rating of single phase transformer from following data core height / distance between core centers = 2.8, diameter of the circumscribing circle / distance between core centers = 0.56, net iron area / area of circumscribing circle = 0.77, current density = 2.3 Ampere / Sq.mm, window space factor = 0.27, frequency = 50 Hz, flux density of the core = 1.2 Wb/sq.m, Distance between the core centers = 0.4 m. (5M)
- b) Derive the expression for output Equation of single phase transformers. (5M)
- 15 a) Find the main dimensions of a 15KW, three phase 400V, 50Hz, 2810rpm squirrel cage induction motor having the efficiency of 88% & full load power factor of 0.9. Specific electric loading = 0.5 Wb/sq.m. specific magnetic loading = 25000 A/m. Take rotor peripheral speed as 20m/s at synchronous speed. (5M)
- b) Explain the step procedure for design of stator in IM. (5M)

OR

- 16 Describe the Effect of dispersion coefficient due to following factor in induction motor
- i) Overload capacity
 - ii) Airgap Length
 - iii) Number of Poles
 - iv) Frequency (10M)
- 17 a) What is runaway speed of an alternator? Justify the statement while the turboalternator are designed to withstand the stresses encountered at 1.25 times the rated speed; the water wheel speed designed for 1.8 to 2.8 times rated speed. (5M)
- b) The runaway speed of 50Hz water wheel generator is 180% of its synchronous speed. If the maximum peripheral velocity of the rotor is to be limited to 140m/s, at runaway speed what will be the maximum permissible pole pitch. (5M)

OR

- 18 a) Estimate the KVA rating of 3 phase, 50 Hz, 2 pole turbo machine having a core length 160cm, peripheral speed 140m/s, $a_c = 525/\text{cm}$ $B_{av} = 0.52 \text{ Wb/m}^2$. Assume uniformly distributed winding. (5M)
- b) Determine the main dimensions of a 12 MVA, 13.8 KV, 50Hz, 1500 rpm 3 phase star connected alternator. It has average gap density = 0.6T ampere conductor per metre = 42000, peripheral speed = 80m/s. Find the maximum flux, the number of slots if one conductor per slot is used, the number of turns per phase. (5M)
- 19 Describe the salient features of computer Aided Design in electrical Machines? What are the advantages of Computer aided design. (10M)

OR

- 20 a) What is meant by discretization in finite element method? (5M)
- b) Explain the hybrid techniques available for computer aided design. (5M)