R20 Regulation *Subject code: 3P3BD*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech III Semester Regular Examinations, February 2022

ELECTRICAL MACHINES - I

(ELECTRICAL & ELECTRONICS ENGINEERING)

Maximum Marks: 70 Date:24.02.2022 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 Explain about the simplex and multiplex winding?
2 List out the various methods of improving commutation?
3 Explain about the significance of Back EMF in dc motor?
4 What is the difference between armature resistance control and field resistance control, while controlling the speed of dc shunt motors?
5 List out the merits and demerits of no-load test of dc machine?
6 Sketch the field's test circuit diagram and list out its limitations?
7 What is all day efficiency? How it is different from normal efficiency.
8 What is the effect of variation of supply voltage on iron losses?
9 Explain why OC test and SC tests are conducted on LV and HV sides of the transformer respectively?
10 What are the merits of auto-transformer over two winding transformers?

Part-B

Answer All the following questions. (5X10M=50Marks)

11 (a) Explain in detail about the constructional features of DC generator.
(b) An 8-pole generator has an output of 200A at 500V, the lap connected armature has 1280 conductors,160 commutator segments. If the brushes are advanced 4-segments from the no-load neutral axis estimate the armature demagnetizing and cross-magnetizing ampere turns per pole. [5+5]

OR

12 (a) What are the possible causes for not building up emf in self-excited DC Generators? What are the remedial measures to be taken?
(b) Draw a developed diagram of 2-layer lap winding for a 4 pole DC generator with 16 coils. [5+5]

13 (a) Explain in detail about the principle of operation of DC motor.
(b) A 220V dc shunt motor runs at 500rpm.When the armature current is 50A.Calculate the speed if the torque is doubled. Given that R_a=0.2Ω. [5+5]

OR

14 (a) How 4-point starter is different from 3-point starter? With a neat sketch explain the construction and working of 3-point stator.

(b) Derive the condition for maximum efficiency in DC machines. [5+5]

15 (a) Explain in detail about the Brake test in a DC shunt machine, with a neat sketch?
(b) In a brake test the effective load on the branch pulley was 38.1kg, the effective diameter of the pulley 63.5cm and speed 12 r.p.s. The motor took 49A at 220V.Calculate the output power and the efficiency at this load. [5+5]

OR

16 With a neat sketch, explain in detail about the procedure of Hopkinson's Test? And list out its merits and demerits. [10]

17 Explain in detail about why hysteresis and eddy current losses occur in a transformer. What are the methods to reduce these losses? [10]

OR

18 (a) Draw and explain the phasor diagram of single-phase transformer on load considering with winding resistance.
(b) A 100kVA lighting transformer has a full-load loss of 3 kW, the losses being equally divided between iron and copper. During a day the transformer operates on full-load for 3 hours, one half-load for 4 hours, the output being negligible for the remainder of the day. Calculate the all-day efficiency. [5+5]

19 (a) Explain in detail about the procedure for conducting Sumpner's test along with all precautions to be taken while conducting the test with neat diagram.
(b) In a 25 kVA, 2000/200 V transformer the iron and copper losses are 350 and 400 W respectively. Calculate the efficiency on UPF at (i) full load (ii) half load. (iii) Determine the load for maximum efficiency and the copper loss in this case. [5+5]

OR

20 (a) Discuss how parallel operation of two single phase transformers is affected by unequal voltage ratios and unequal per unit leakage impedances but same X/R ratio.
(b) A balanced 3-phase load of 150kW at 1000V,0.866 lagging power factor is supplied from 2000V, three-phase mains through single-phase transformers (assumed to be ideal) connected in (i) delta-delta (ii) open-delta. Find the current in the windings of each transformer and the power factor at which they operate in each case. [5+5]