R20

B.Tech II Year I Semester (R20) Supplementary Examinations April/May 2024
DC MACHINES & TRANSFORMERS
(Electrical & Electronics Engineering)

Time: 3 hours   Max. Marks: 70

PART – A
(Compulsory Question)
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1   Answer the following: (10 X 02 = 20 Marks)
  (a)   Write the applications of Permanent Magnet Materials.   2M
  (b)   Explain principle of conversion of energy.   2M
  (c)   Name any 4 parts of a DC generator & state the function of each part.   2M
  (d)   Define the terms "critical speed, critical field resistance" in DC Shunt Generator?   2M
  (e)   Name different types of DC Motors & give any two applications of DC Series Motors and Shunt   2M
     Motor.
  (f)   Explain the necessity of Starter in DC Machines.   2M
  (g)   What is the condition for maximum efficiency of Transformer & what are the necessary tests to   2M
     determine the efficiency, voltage regulation?
  (h)   What is hysteresis loss in transformer & how to minimize it?   2M
  (i)   What are no-load & on-load tap changers?   2M
  (j)   Write any four differences between shell type & core type 3-Ø transformers.   2M

PART – B
(Answer all the questions: 05 X 10 = 50 Marks)

2   (a)   A conductor of 25 m length moves at right angle with a uniform velocity of 5 m/s in a uniform   5M
     magnetic field of 1wb/m² flux density. Determine the emf induced in the conductor. Also, find
     the emf induced in the conductor when the conductor moves at an angle 60º to the direction
     of the field.
  (b)   Differentiate soft & hard magnetic materials.   5M
OR
3   (a)   Explain and derive expression for energy in a singly excited magnetic field system.   5M
  (b)   What are Ferromagnetism and Anti-ferromagnetism? Explain.   5M

4   Explain effect of Armature Reaction & methods to reduce armature reaction.   10M
OR
5   Explain characteristics of a DC Series Generator & Shunt Generators with neat circuit   10M
    diagram.

6   (a)   What is the working principle of DC Motor & derive the electromagnetic torque equation a DC   5M
     motor?
  (b)   Determine the torque developed by a 350v DC Motor having an armature resistance of 0.5 Ω   5M
     and running at 15 rps .The armature current is 60A.
OR
7   Explain in detail about Swinburne's test.   10M

8   Explain the principle, construction & operation of 1-Ø Transformers.   10M
OR
9   Explain about Sumpner's test in 1-Ø transformers in detail.   10M

10   Explain the operation of Star-Star Connection & Delta-Delta Connection of 3-Ø Transformers. 10M
OR
11   Draw equivalent circuit of a three-winding transformer & explain short-circuit test and open-   10M
    circuit test of three-winding transformer.

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B.Tech II Year I Semester (R20) Supplementary Examinations August/September 2023
DC MACHINES & TRANSFORMERS
(Electrical and Electronics Engineering)

Time: 3 hours   Max. Marks: 70

PART – A
(Compulsory Question)
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1   Answer the following: (10 X 02 = 20 Marks)
  (a)   Discuss briefly the principle of energy conversion.   2M
  (b)   State the applications of permanent magnet materials.   2M
  (c)   If the direction of rotation is reversed, will the generator voltage build up or not? Comment up on   2M
        your answer.
  (d)   What is the function of compensating winding?   2M
  (e)   Explain back emf with respect to DC motor   2M
  (f)   Which losses of a DC shunt motor are constant and Why?   2M
  (g)   How to eliminate third harmonic voltages in polyphase transformers?   2M
  (h)   Explain why parallel operation of transformer is necessary.   2M
  (i)   What are the salient features of delta-star connected three-phase transformer?   2M
  (j)   List the advantages of three – phase transformer over three single – phase transformers.   2M

PART – B
(Answer all the questions: 05 X 10 = 50 Marks)

2   Show that the field energy in a linear magnetic system can be given as   10M
        $W_f = \frac{1}{2}\frac{\lambda^2}{L} = \frac{1}{2}Li^2$.

OR

3   Why most practical energy conversion devices use magnetic field as the coupling medium   10M
        between electrical and mechanical systems. Discuss with an example.

4   Describe the process of voltage build up in self-excited generators.   10M

OR

5   A 20 kW, 250 V, 6 pole lap connected dc generator runs at 1250 rpm. Armature has 550   10M
        conductors. For full load armature – ohmic loss of 250 W, find the useful flux per pole. Take 2 V
        as the brush drop at full load.

6   Explain with the help of a neat sketch the principle of operation of a four-point starter.   10M

OR

7   The armature of a 4 pole lap wound dc machine has core length = 45 cm, diameter = 50 cm,   10M
        total conductors = 500, speed =1200 rpm and current = 25 A. For an average flux density of 0.6
        T, find the electromagnetic (or gross mechanical) power developed and the internal torque.

8   The test results of 2.5kVA, 230/115V single-phase transformer are as follows: 10M
        OC Test: 115 V, 1.2A, 60 W
        SC Test: 12 V, 10.86A, 120 W
        Find:
        (i) efficiency at 50% full load, 0.8 pf,
        (ii) regulation at 30% full load, 0.8 pf lag and lead.

OR

9	(a)	Draw the phasor diagram of an ideal transformer on no load. Also, draw a phasor diagram of a practical transformer supplying lagging power factor load.	7M
	(b)	Why transformers are rated in KVA.	3M
10	(a)	Explain the working of Off-Load tap changing transformer with help of neat diagram.	7M
	(b)	What are the advantages and disadvantages of delta-delta connection?	3M

OR

11	A balanced 3-phase, 250 kW load at 415 V and 0.88 power factor lagging is to be supplied from a two – phase 1100 V supply. Determine voltage and current rating of each winding of scott connected transformers and KVA rating of each unit.	10M

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