

II B. Tech I Semester Supplementary Examinations, October/November - 2019
ELECTRICAL MACHINES-I
 (Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answer **ALL** the question in **Part-A**
 3. Answer any **THREE** Questions from **Part-B**

PART -A

- 1 a) What is field energy? What is the relation of mechanical energy and field energy? [4M]
- b) Enumerate the difference between lap-winding and wave-winding. [4M]
- c) List out the applications of DC generators. [3M]
- d) Explain the speed torque characteristics of DC shunt motor. [4M]
- e) Explain dynamic and regenerative braking. [3M]
- f) What number of armature slots is to be used? Write merits and demerits. [4M]

PART -B

- 2 a) Explain the principle of energy conversion. Draw the general representation of electro-mechanical conversion device. [8M]
- b) Derive the expression for magnetic force in a singly excited electromagnetic system. [8M]
- 3 a) What are the causes of sparking in a d.c. machine? Explain how commutation is improved by use of inter poles. [8M]
- b) A 22.38 kW, 400-V, 2-pole wave-wound d.c., shunt motor has 840 armature conductors and 140 commutator segments. Its full-load efficiency is 88% and the shunt field current is 1.57A. If brushes are shifted backward through 1.5 segments from the geometrical neutral axis, find the demagnetizing and distorting amp-turn /pole. [8M]
- 4 a) Sketch the internal and external characteristics of DC shunt and series generators. What are their fields of application? [8M]
- b) Explain the process of voltage build up in a dc shunt generator. What is critical field resistance? [8M]
- 5 a) Discuss Armature reaction and commutation in DC motors. Explain their effects on the performance of the motor and give remedies to their effects. [8M]
- b) A 6-pole DC motor has a wave connected armature with 87 slots, each slot containing 6 conductors. The flux per pole is 20 m.wb and the armature has a resistance of 0.13 ohm when the motor is connected to 240V supply and the armature draws a current of 80A driving a load of 15KW. Calculate (i) Speed (ii) Armature Torque and (iii) shaft Torque. [8M]

- 6 a) What are the different speed control methods of DC Shunt motor? Explain each method and enumerate advantages and disadvantages. [8M]
- b) A retardation test is made on a separately excited DC machine as a motor. The induced EMF falls from 240 V to 175 V in 45 Seconds on opening the armature circuits and 5 Seconds on suddenly changing armature connection from supply to a load resistance taking an average current of 10A. Find the efficiency of the machine when running as a motor and taking a current of 25 Amp on a supply of 240V. The resistance of armature is 0.4Ω and that of its field winding is 300Ω . [8M]
- 7 a) Explain the choice of specific electric and magnetic loadings. [8M]
- b) How do you estimate number of conductors/turns for design of DC machine? [8M]

