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Paper ID [A0407]

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B.Tech. (Sem. - 4th)

ELECTROMECHANICAL ENERGY CONVERSION AND DC MACHINES (EE - 202)

Time : 03 Hours Maximum Marks : 60

Instruction to Candidates:

1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section - A

Q1) *(10 × 2 = 20)*

a) Explain the function of a commutator in DC machine for motoring and generating action.

b) Distinguish between Lap and Wave Winding of DC machines.

c) Write the principle of reluctance motor.

d) Describe the principle of energy conversion.

e) Explain the term constant torque drive.

f) Draw the power flow diagram of DC motor.

g) Explain the working principle of cross field-meta dyne generators.

h) Discuss the limitations of 3-point starters.

i) Distinguish between coil pitch and pole pitch.

j) Distinguish between armature and field control for DC motor.

Section - B

(4 × 5 = 20)

Q2) (a) Describe the advantages of using several small DC generators in parallel over the use of single large generator.

(b) What are the two conditions for connecting two DC shunt generators in parallel.

Q3) Estimate the number of turns needed on each commutating pole of a 6-pole generator delivering 200k W at 200V, given that the number of armature conductors is 540 and the winding is lap connected interpole air-gap is 1.0cm and the flux density in the interpole air-gap is 0.3 wb/m^2. Neglect the effect of iron parts of the circuit and of leakage.

Q4) Explain the Hopkinson Test of DC machine in details with the help of connection diagram.

Q5) Discuss the various methods used for speed control of DC motors.

Q6) Discuss the Three point starter with neat sketch.

Section - C

(2 × 10 = 20)

Q7) A cross-field generator with no compensation, has the following parameters:

$r_a = 4\Omega$, $L_a = 1H$,

$r_f = 25\Omega$, $L_f = 2.5H$, $M_d = 1.2H$

Transformer mutual inductance terms may be neglected.

(a) The machine, initially unexcited, is running at a speed of 200 rad / sec. and is connected to a load of 4Ω resistance. Find an expression for the load current (or output current) when 25 V is suddenly applied to the field winding.

(b) After load current has become constant in part (a); an additional resistor of 4Ω is inserted in the load circuit. Find load current as a function of time.

Q8) Discuss the methods in details to achieve sparkles commutation.

Q9) (a) In a break test on DC motor, the effective load on the brake drum was 23kgf, the effective diameter of the drum 45cm and the speed 960 rpm. The input of the motor was 28 A at 230 V. Calculate the efficiency of the motor.

(b) Discuss the principle working and construction of hysteresis motor with neat sketch.

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