

This exam measure ILOs (a1, a15, b2, b5, c3, c16, d5, d7)

Attempt to solve all questions

Q1: (15 Marks)

a) Discuss the effect on the magnitude of force and direction on a current-carrying conductor.

b) The Solenoid consists of 600 turn's rolls along its length by uniform distributed, and has length of 90 cm. If the current path through the coil is 5 A and the coil cross section is 8 cm calculate: flux and flux density in case of the core is made from nonmagnetic material. Flux and flux density in case of the core is made from magnetic material have relative permeability of 200.

Q2: (15 Marks)

a) With the help of a neat diagram show power division in DC generator

b) A 4-pole lap wound shunt generator supplies to 50 lamps of 100 W, 200 V each. The field and armature resistance are 50 Ω , and 0.2 Ω respectively. Allowing the brush drop is 1 V, calculate the following: I_a , I_z , emf, P_o

Q3: (20 Marks)

a) Explain with the help of net sketches the phenomena of commutation in dc machine, state and discuss the methods adapted for minimizing the sparking at the brushes.

b) A 4-pole wave-wound motor armature has 880 conductors and delivers 120 A. The brushes have been displaced through 3 angular degrees from the geometrical axis. Calculate (a) demagnetising amp-turns/pole (b) cross- magnetising amp-turns/pole (c) the additional field current for neutralizing the demagnetisation of the field winding has 1100 turns/pole.

Q4: (15 Marks)

a) Draw the magnetic circuit of a 4 pole D.C. machine.

b) The following is the external characteristic of a shunt generator:

I_L , A	0	4	8	12	16	20
Emf, V	89.5	88.5	87	84.5	82.2	79

Plot internal characteristic if the armature and shunt field resistances are 0.22 and 45 ohms, respectively.

Q5:

(15 Marks)

- Drive an expression for the torque of dc motor.
- A 4 pole, 32 conductor, lap-wound d.c. shunt generator with terminal voltage of 200 volts delivering 12 amps to the load has $r_a = 2$ and field circuit resistance of 200 ohms. It is driven at 1000 r.p.m. Calculate the flux per pole in the machine. If the machine has to be run as a motor with the same terminal voltage and drawing 5 amps from the mains, maintaining the same magnetic field, find the speed of the machine.

Q6:

(10 Marks)

A 150 kW, 230 V, 500 rpm, dc shunt motor has a square field coil. Find its number of poles and the main dimension and air gap length, assuming B_{av} over the pole arc = 0.85 wb/m^2 . $ac = 2900 \text{ A/m}$, the ratio of width of pole body to pole pitch is 0.55, pole arc to pole pitch is 0.7, $\eta = 0.91$, $AT_g = 0.55 AT_a$, field form factor is $K_f = 0.7$

With my best wishes

Dr. Eng./Mohamed I. Abd EL_Wanis