Y٥

KafferElshikha University
Faculty of Engineering
Electrical Engineering Department
Final Exam 2013-2014, 3rd Year

Subject: Machine 1
Time Allowed: 3 hours
Examiner: Dr.S.Gharib
Date: 23 / 1 / 2017

Q1

a) What is meant by:

coil span -Dummy Coils - compensating winding

b) Determine induced emf developed by a 6-pole dc generator with 300 conductors arranged in a lap winding. The flux per pole is 0.3 Wb. The conductor current is 12 **A.** If the armature speed is 600 rpm, what is the power developed? What is the torque developed?

c) A 240-V, **40-A, PM** dc generator is rated at a speed of 2000 rpm. The armature-winding resistance is 0.4 Ω. The rotational loss is 10% of the power developed by the generator at full load. If the generator is operating in the linear range, determine:
(i) the no-load voltage, **(ii)** the voltage regulation,
(iii) the developed torque, and (1V) the efficiency of the generator.

Q2

a) With the help of shunt DC generator characteristics explain how it can build up.

b) What are the two components of armature reaction and what are their effects to the main flux.

c) A 4 pole wave wound G has armature conductors of 880 ,it delivers 122 A the brushes were displaced with 3 angular degrees from the geometric axis Find :
i) Demagnetizing magneto-motive force component per pole
ii) Cross- magnetizing amp- turn per pole
iii)The additional field current to neutralize the demagnetization with field winding of 1200 turn/pole.

Q3 20

a) What are the criteria for which the dc machine permanent magnet is maximum.

b) A 50-kW, 120-V, long-shunt compound generator is supplying a load at its maximum efficiency and the rated voltage. The armature resistance is 50 m Ω, series field resistance is 20 m Ω, shunt field resistance is **40** Ω, and rotational loss is 2 kW. What is the maximum efficiency of the generator? where the condition to long shunt compound G is

$$I_{Lm}^2(R_a + R_s) = P_r + I_f^2(R_a + R_s + R_f)$$

c) With the help of dc generator characteristics explain what is meant by a field resistance and speed critical values.

Q4

a) Explain why a series resistance is added in dc motor circuit at starting.

b) With the help of Dc shunt motor show what happen to the back e.m.f and the motor speed when I_a increase dramatically.

c) A series motor operates in the linear region in which the flux is proportional to the armature current. When the armature current is **12** A, the motor speed is **600** rpm. The line voltage is 120 **V,** the armature resistance is 0.7 Ω, and the series field-winding resistance is **0.5** Ω. What is the torque developed by the motor? For the motor to operate at a speed of **2400** rpm, determine:

(i) the armature current and (ii) the driving torque.