امتحان تخلفات 2014/2015
Second year: Electrical Power and Machines Engineering
Total Marks: 120
Course Title: Electrical Machines (1)

Time: 3 hour
Date: June , 2015
Code: EPM2208

Question 1:

Marks[20]

State **true or false** and correct the false statements rationally.

a- Each of the following points equals 1 marks

1- A Long shunt compound generator, fitted with Interpoles, is commutatively compound. If supply terminals unchanged and the machine runs as a motor, it will be differentially compound.

2- The frequency of armature current depends only on speed.

3- The increase of brush resistance enhances commutation and voltage regulation.

4- The external generator characteristic is a relation between induced EMF and armature current.

5- Each equalizing ring connects a number of conductors equals number of poles.

6- The resultant pitch of retrogressive lap windings is positive odd number.

7- Number of parallel paths of wave windings is equal to the number of pole pair.

8- The critical resistance of series generator is the summation of armature and field resistance.

9- Iron losses are found in stator only while cupper losses are found in stator and rotor.

10- Increase of armature inductance enhances the commutation.

b- A 2-poles DC generator with simple 2-layer lap winding with 6 armature coils, Determine:
   1- Number of commutator segments
   2- Front pitch, back pitch and commutator pitch.-
   3- Draw the development winding and show the brush position.   **[10 Marks]**

Question 2:

Marks[20]

a- Draw the laboratory circuit connection(s), with suitable measurements instruments, and the equivalent circuit that is used to determine the no load characteristics of shunt generator. Define all used symbols. Suggest a table of results. Draw the relevant

runs at 800 rpm taking a current of 100 A. What must be the resistance of a diverter connected across the armature to reduce the speed to 500 rpm. Assume the armature current to be constant.   **[10 Marks]**

[b] A 500 V, 45 kW, 600 rpm DC shunt motor has a full load efficiency of 95%. The field resistance is 300 Ohm, and armature resistance is 0.4 Ohm. Find the speed under each of the following conditions at which the motor will develop an elecro-magnetic torque equal to ¾ of rated value:

        (i) Regenerative braking: no limiting resistance.

        (ii) Plugging: external limiting resistance of 8.5 Ω inserted.

The field current is maintained constant and armature reaction and the brush drop are neglected.   **[10 Marks]**

Question 6:   Marks[20]

[a] Aided with neat illustration(s) and equation(s), explain in details, Swinburne's test for determining the efficiency of a DC machine. Explain briefly how the efficiency can be found in brake test.   **[10 Marks]**

[b] A 220 V, 15 kW shunt motor has a maximum efficiency of 90% and a speed of 1000 rpm when delivering 90% of its rated output. The shunt-field resistance is 100 Ohm. Determine the efficiency and speed when the motor draws a current of 110 A from the mains.

                                                                 [10 Marks]

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Faculty Of Engineering

REPETED- EXAM.2014/2015

Course	Power Electronics (1)EPM2209	Time	3 hours
Students	2nd Year Electrical Power and Machines Engineering	Mark	100
Date	16/5/2015	No. of Pag.	1

Answer ALL the following questions:

The first question (25 marks)

A	Discuss briefly the effect of gate current of SCR on its anode current
B	A single-phase half wave rectifier is used to charge a battery of 60V and 300 W-H. If the supply voltage is 110 V, find (a) The diode conduction angle;(b) The charging time in hours; (c) The value of current limiting resistor for 10A (DC current) flows through battery; (d) The power loss through the current limiting resistor; and(e) The circuit efficiency.

The second question (25 marks)

A	Drive an expression for the reduction of the output voltage due to the source inductance effect for three-phase uncontrolled rectifier.
B	Three-phase full-wave uncontrolled rectifier is supplied from star connected supply of 380 V, 50Hz. The load current is 50 A and a negligible ripples, calculate. (a) the reduction of output voltage due to commutation if the source inductance is 0.4 mH /phase (b)the average and rms of diode current; (c) the input power factor; (d) the transformer utilization factor; (e) the PIV of diodes

The third question (25 marks)

A	How can you protect SCR from di/dt and dv/dt?
B	Single-phase semiconverter is used to feed a highly inductive load with resistance of 5 ohm. If thesupply voltage is 220 V and converter delay angle is 60^0, determine: (a) Average and r.m.s value of output voltages; (b) the average and r.m.s value of output currents; (c) the average and r.m.s value of thyristor currents; (d) the rectifier efficiency and ripple factor of input current;

The fourth question (25 marks)

A	What are the methods used to improve the system power factor? And discuss briefly the extinction angle control method?
	Single phase series full converter is connected to feed a highly inductive load with ripple free average load current and resistance 30 ohm. The supply voltage is 220 V and Np: Ns = 2:1. If the average output voltage is 70 % of the maximum possible average output voltage, calculate: (a) the delay angles of the converters; (b) the rms and average load voltage of the converter; (c) therms and average SCR currents; (d) the input power factor and TUF.

Good Luck and best wishesDr. Abdelwahab Hassan