Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech.**

PCEE4203

4th Semester Back Examination 2017-18
ELECTRICAL MACHINE - I
BRANCH : EEE, ELECTRICAL
Time : 3 Hours
Max Marks : 70
Q.CODE : C1109

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Q1 **Answer the following questions:** **(2 x 10)**

a) Draw the magnetic circuit of 4-pole machine.
b) Differentiate between good and poor commutation, what may be the cause of poor commutation
c) A series generator is connected to Bus-Bar, if the prime mover fails in which direction the machine will continue to rotate. Justify your answer.
d) With the help of a neat diagram show the power division in a Dc generator.
e) What is an equalizer? When must it be used?
f) A shunt generator and a series generator with same voltage rating are operating at no load condition with rated speed. Should the output voltages be the same or different? Justify your answer.
g) Under what condition a transformer will have zero voltage regulation?
h) Explain how core loss in a transformer is represented in its equivalent circuit?
i) For an induction motor if the input voltage is changed by 10% What will be the percentage change in torque developed?
j) Why power factor of 3-phase induction motor is low at no-load.?

Q2 **a)** A separately excited generator running at 1000rpm, supplies 200A at 125V. What will be the load current when the speed drops to 800rpm? Considering armature resistance of 0.04 Ω and 1V drop per brush. **(5)**

b) A long shunt generator running at1000rpm supplies a load of 22Kw at a terminal voltage of 220V. The armature resistance, shunt field resistance and series field resistance are 0.05 Ω, 110 Ω and 0.06 Ω respectively. The overall efficiency is 88%. Find copper loss, iron and friction loss, maximum efficiency. **(5)**

Q3 **a)** The armature and shunt field resistance of a 500V shunt motor are 0.2 Ω and 100 Ω respectively. Find the resistance of the shunt field regulator to increase the speed from 800 rpm to 1000 rpm, if the current taken by the motor is 450A. Assuming the magnetization characteristics to be linear. **(5)**

b) What is interpole and describe its working? **(5)**

Q4 **a)** Two shunt generators operating in parallel deliver a total current of 250 A. One of the generators is rated 50 kW and the other 100 kW. The voltage ratings of both the machines are 500 V and have regulations of 6 % (smaller one) and 4 % (larger). assume linear characteristics and determine:
(a) the current delivered by each machine and
(b) the terminal voltage. **(5)**

b) Draw and explain the construction and working detail of a 4-point starter. Write its advantages and disadvantages **(5)**

Q5 **a)** A 100 kVA transformer has its turns ratio to be 400/80. The primary and secondary resistances and leakages reactance are 0.3 Ω, 0.01 Ω, and 1.1 Ω, 0.035 Ω respectively. Applied voltage to the primary is 2.2kV. Calculate the (i) equivalent impedance visualized from the primary side and (ii) also the % voltage regulation at FL at (a) 0.9 PF lag and (b) 0.9 PF lead. **(5)**

b) A single-phase 2.2 kVA, 220/110V transformer has a maximum efficiency of 96% at a load of 60% at Unity power factor. What are the values of constant and copper losses at this load condition? What is the efficiency of this transformer at full-load condition at 0.8 PF lagging condition? **(5)**

Q6 **a)** A 500/250V, 5 kVA two-winding transformer is to be used as an auto transformer to supply a 500 V circuit from a 750 V source at 50 Hz. When tested as a two winding transformer at rated load, it yielded an efficiency of 96% at 0.8 PF lagging. (a) Show the connection diagram as an auto-transformer. (b) Determine its kVA rating as an auto-transformer. (c) Find its efficiency at FL at 0.8 PF lagging as an auto-transformer **(5)**

b) A three phase induction motor has a 4 pole star connected stator winding. Themotor runs on a 50 Hz supply with 200 V between lines. The rotor resistance and standstill reactance per phase are 0.1 ohm and 0.9 ohm respectively. The rotor e.m.f per phase at standstill is 77.4 V. Calculate (i) torque at 4% slip (ii) slip at which maximum torque occurs (iii) value of maximum torque (iv) speed at maximum torque. **(5)**

Q7 **a)** The rotor of a 6 pole, 50Hz slip ring induction motor has rotor resistance of 0.2Ω per phase and total leakage reactance of 2.5Ω per phase .It runs at 1440 rpm with certain load .Calculate the external resistance per phase which must be added to reduce the speed to 1300 rpm, the load torque reaming the same ? **(5)**

b) Explain the Torque ~ Slip characteristic of a 3 phase induction motor by drawing suitable diagram? **(5)**

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Armature reaction

b) Back to Back test of two transformer.

c) Hopkinson's Test

d) Speed Control of Induction Motors