

Code No: W0221

R07**SET - 1****II B. Tech I Semester Supplementary Examinations, May/June - 2017****ELECTRICAL MACHINES - I**

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) State and explain the principle of energy conversion?  
b) A doubly excited magnetic field system has the following inductances in terms of angle  $\theta$  between the stator and rotor coils.  
Stator self-inductance,  $L_{ss} = 0.50$  H  
Rotor self-inductance,  $L_{rr} = 0.30$  H  
Mutual inductance,  $M_{sr} = 0.40 \cos \theta$  H  
If the current flowing the stator and rotor are 10 A and 8 A respectively, calculate the mechanical torque developed?
2. a) Draw the winding table for a 2-pole lap connected DC machine with 12 armature conductors. Indicate the brush positions and polarity of induced e.m.f.  
b) Derive an expression for induced e.m.f in the armature of dc machine?
3. a) Describe the effects of armature reaction on the operation of DC machines. Describe also the remedies employed for decreasing the effects of armature reaction.  
b) A 4 – pole DC generator supplies a current of 143A. It has 492 armature conductors. When delivering full load, the brushes are given an actual lead of  $10^\circ$ . Calculate demagnetizing ampere turns per pole and number of extra field turns to neutralize the demagnetization when the machine is (i) lap connected (ii) wave connected. Assume the machine is shunt machine with  $I_{sh} = 10$ A.
4. a) Distinguish between self- excited and separately excited DC generators. How the self-excited generators are classified? Give their circuit diagrams.  
b) What is the critical field resistance of a DC shunt generator? Explain.
5. a) What is parallel operation? How do you connect the two shunt generators in parallel? Explain briefly?  
b) Briefly explain load characteristics of different types of compound generators?
6. a) Derive an expression for the torque of a DC motor.  
b) A 220 V dc shunt motor takes no load current of 10 A and runs at 750 rpm. At full load the armature current is 100 A and the motor runs at 690 rpm. Resistance of the armature is 0.1 ohms. Calculate the following: (i) back e.m.f at no load and full load (ii) percentage of reduction in flux due to armature reaction.

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7. a) A 220V shunt motor takes 60A when running at 800 rpm. It has an armature resistance of 0.1 ohm. Find the speed and armature current if the magnetic flux is weakened by 20%, contact drop per brush = 1V. Total torque developed remains constant.  
b) Explain with a neat sketch how speed control of a DC motor is done by Ward Leonard method. Discuss its merits and demerits over other methods.
8. a) Explain a suitable method for determining the efficiency of a series motor.  
b) In Hopkinson's test on two identical dc shunt machines, the following readings were obtained: Line current: 49.4 A; Line voltage: 460 V; Motor armature current: 300 A; Field currents: 5 A; and 4.4 A. The armature resistance of each machine is 0.05 ohms. Calculate the efficiency of each machine.