

## II B.Tech I Semester(R07) Supplementary Examinations, May/June 2010

ELECTRICAL MACHINES-I  
(Electrical & Electronic Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions  
All Questions carry equal marks

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1. (a) Derive the expression for the forces developed in electro magnetic system.  
(b) In a rectangular electro magnetic relay, the exciting coil has 1500 turns. Cross sectional area of the core is  $A = 5 \text{ cm} \times 5 \text{ cm}$ . neglect the reluctance of the magnetic circuit and fringing effects. With coil current kept constant at 2A. Find the mechanical energy output when the armature air gap decreases from 1 cm to 0.5 cm . [8+8]
2. What are the ordinary types of armature winding for dc machine? Explain the essential difference between them and give relative merits and the applications of the two types windings. [16]
3. (a) Explain briefly the purpose of commutator in d.c. machine.  
(b) Explain how commutation is improved by use of interpoles. [8+8]
4. (a) A short shunt compound generator delivers a load of 15 KW at 200 V and through a pair of conductors of total resistance  $0.1 \Omega$  and armature, series field and shunt field resistance of  $0.04$ ,  $0.03$ , and  $80 \Omega$  respectively. What is the emf generated. Allow  $1.0 \text{ V}$  per brush contact drop  
(b) A shunt generator has following magnetizing curve  

$I_f (\text{A}) :$	0	0.5	1.0	1.5	2
$E (\text{V}) :$	4	42	78	93	100

 Calculate the value of critical resistance. Also find the value of open circuit voltage when the field resistance is  $60 \Omega$ . [8+8]
5. Draw and Compare the load characteristics of shunt and series generators. [4+12]
6. (a) Explain the operating characteristics of dc series motors?  
(b) A 250 V shunt motor has an armature current of 20A when running at 1000 rpm against full-load torque. The armature resistance is  $0.5 \text{ ohm}$ . What resistance must be inserted in series with the armature to reduce the speed to 500 rpm at the same torque, and what would be the speed if the load torque is halved with this resistance in the circuit. Assume the flux to remain constant throughout and neglect brush contact drop. [6+10]
7. (a) With a neat diagram explain the operation of 3-point starter.  
(b) The efficiency of a 7.5 kw, 220V shunt motor is 90%. The armature ohmic losses are 50% of total losses. Normal field current is 1A. Find the resistance of 6 stud starter if maximum armature current is twice the full load value. [10+6]
8. The no-load test of a 44.76 kW, 220V, dc shunt motor gave the following figures:  
Input current=13.25A; field current=2.55A; resistance of armature at  $75^\circ\text{C}$ = $0.032 \Omega$  brush drop =2V.  
Estimate the full-load current and efficiency. [16]

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