Class: TY Electrical	**Subject: Electrical Machine Design**
	Question bank
1	What are the modern trends in design and manufacturing of electrical machines? Explain in brief.
2	What is the importance and purpose of specification in design and manufacturing of electrical machines? State the standard specification of transformer.
3	A Heating furnace operates at 230 volts and is made of nichrome wire. If the electric power input is 2.5 KW for raising the temperature to 1200^0C. What should be the length and diameter of the wire? e = 0.9 and radiating efficiency = 1. Assume any other required data such as ambient temperature.
4	Explain in brief the various limitations in design of electrical machines.
5	Grade the resistance of a 5 section (element) starter for a 7.5 KW, 250V, 750 rpm d.c. shunt motor from the following data. Max. torque during starting period = 1.5 times full load torque, full load efficiency 85.5%. Armature circuit copper loss is 50% of total losses. Field current = 2.6 Amp.
6	Starting from first principal prove that for a dc shunt motor starter K = n $\sqrt{\frac{R1}{rm}}$ Where K = $\frac{I1}{I2} = \frac{I\ max}{I\ Min}$. (during starting) ; R_1- total resistance in field circuit at starting in armature circuit, when starter handle is on stud no. I r_m = armature resistance of motor.
7	A 400V, 6 pole DC shunt generator field winding is to be designed. find (a) cross section area and diameter of shunt field winding. (b) No. of turns (c) Resistance of each coil 'R_f' (d) Shunt field current. Following is the data/particulars i) mmf per pole = 5000 = AT ii) pole size 200 X 120 mm^2 iii) winding cross section 120 X 25 mm^2 (area of c.s.) iv) $\varrho = 2 \text{ X } 10^{-8}\Omega - r$ v) conductor insulation thickness = 1 mm vi) voltage drop = 62.5V

<table>
<tr><td>8</td><td>Design a field regulator for a dc shunt generator. Number of studs to be provided = 7. Variation limits of EMFs are 500 to 560 volts in equal steps. The field winding resistance is 934 Ω. The O.C.C is per table below. Calculate the values of element /section of starter resistance in ohms
<table>
<tr><td>Field current I_f</td><td>0.4A</td><td>0.45A</td><td>0.51A</td><td>0.55A</td><td>0.6A</td></tr>
<tr><td>Generated voltage EMF</td><td>500V</td><td>520V</td><td>540V</td><td>550V</td><td>560V</td></tr>
</table></td></tr>
<tr><td>9</td><td>An electro magnet can lift a maximum load of 246 kg through a distance of 20 mm. The area of pole face is 50 cm^2. Calculate the flux density in the air gap in tesla. Determine also the mmf required for the air gap, mmf for iron part, total A.T. (mmf) and the number of turns used in electromagnetic if max current is limited to 8 amp. Amp – Turns for iron part may be assumed to be 25% of air gap.</td></tr>
<tr><td>10</td><td>Design an iron core choke to be connected to a supply single phase ac of 230v and to carry current of 2 amp. Assume stacking factors for core Sf = 0.9, current density 2.3A/mm^2 , core cross section is square , B_m = 1 web/m^2</td></tr>
<tr><td>11</td><td>Define following terms with reference to armature lap winding of dc machine
A. Coil
B. Back pitch Y_b
C. Front pitch Y_f
D. commulator pitch Y_c</td></tr>
<tr><td>12</td><td>Determine the a) back pitch Y_b b) front pitch Y_f resultant pitch Y_r and prepare the winding table for 4 pole, 16 slot simplex lap wound dc generator with 16 coils</td></tr>
<tr><td>13</td><td>Draw the developed diagram for a 4 pole, 12 slots double layer simplex lap winding connected for dc generator commutator having 12 segments. show the position of brushes on commutator segment</td></tr>
</table>