

Reg. No.:

--	--	--	--	--	--	--	--

MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL
(A Constituent Institute of MAHE, Deemed University)

THIRD SEMESTER B.E. DEGREE MAKEUP EXAMINATION
(REVISED CREDIT SYSTEM)

11 January 2007

ELECTRICAL MACHINERY - I (ELE-205)

Time: 3 hours

Max. Marks: 50

Note: Answer any **FIVE** full questions.

1	A)	A 15kW, 400V, 50Hz, 3 phase star connected induction motor gave the following test results. No-load test: 400V, 9A, 1310W. Short circuit test: 200V, 50A, 7100W. The stator and rotor ohmic losses at standstill are assumed equal. Draw the circle diagram and calculate at full load (i) Line current (ii) power factor (iii) torque (iv) efficiency. Also find the starting torque and maximum torque. 08
	B)	Compare power transformers with distribution transformers. 02
2	A)	Two single phase furnaces A and B are supplied at 80V by means of a Scott connected transformer combination from a 3 phase 6000V system. The voltage of furnace A is leading. Calculate the line currents on the 3 phase side when furnace A takes 500kW at 0.707 p.f. lag and furnace B takes 800kW at 0.8 p.f. lag. Also draw the phasor diagram. 07
	B)	Determine a suitable auto-transformer ratio for starting an induction motor with a supply current not exceeding twice full load current. Short circuit current = 6 times full load current, full load slip is 3%. Estimate starting torque in terms of full load torque. 03
3	A)	Prove that the speed of rotating field is inversely proportional to number of poles in a 3 phase induction motor. 02
	B)	A 440V, 3 phase star connected wound- rotor induction motor has a ratio of transformation from stator to rotor of 2.5. At full load operation, the slip emf is 4V per phase. If the load torque varies as the square-root of slip, then compute the value of injected voltage required to make the slip 4%. Neglect rotational losses and rotor leakage reactance. 05
	C)	What are the different types of DC generators? Also mention their applications. 03
4	A)	Find the demagnetizing mmf per pole for a 250kW, 400V, 6 pole DC generator with 720 conductors. The brushes are given a lead of 2.5 mechanical degree. Also derive the expressions used. 04
	B)	A 3 phase star connected 400V, 4 pole 50Hz induction motor has the following parameters referred to stator. $R_1=0.15\Omega, R_2=0.12\Omega, X_1=X_2=0.45\Omega, X_m=28\Omega$. Draw the exact equivalent circuit diagram and hence find (i) stator current and p.f. (ii) efficiency (ii) torque developed at a slip of 5%. 06
5	A)	A 5kVA, 220/110V transformer has the maximum efficiency of 96.97% at power factor lagging. Its core loss is 50W and full load regulation at 0.8 p.f. is 5%. Find the efficiency and regulation at full load 0.9 power factor lagging.

		At what p.f. at full load, the regulation will be (i) maximum (ii) minimum and (iii) zero? Calculate maximum and minimum regulations. 07
	B)	A universal motor when operating on 220V dc draws 10A and runs at 1400RPM. Find the new speed and p.f. when connected to 220V 25Hz supply, the motor current remaining the same. The motor has a total resistance of 1Ω and total inductance of 0.1H. 03
6	A)	Explain how tertiary winding helps to stabilize the neutral potential in star-star connected bank of single phase transformers. 02
	B)	The daily variation of load on a 100kVA transformer is as follows: 6AM to 1PM 65kW, 45kVAR 1PM to 6PM 80kW, 50kVAR 6PM to 11PM 30kW, 30kVAR 11PM to 6AM No load The transformer has no load core loss of 370W and a full load ohmic loss of 1200W. Determine the all day efficiency of transformer. 03
	C)	Two 6600/440V, 3 phase transformers, A of 250kVA and B of 500kVA have the following particulars per phase referred to the secondary side; A: $R=0.008\Omega$, $X=0.035\Omega$; B: $R=0.003\Omega$, $X=0.019\Omega$. How will they share a load of 600kVA at a p.f. of 0.8 lagging. 05

How To Exam