Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (New) EXAMINATION – WINTER 2018

Subject Code: 2131005 Date: 12/12/2018

Subject Name: Electrical Machines

Time: 10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1*	**(a)**	Describe how the primary current adjusts itself as the load on a transformer is increased?	**03**
	(b)	Explain why the core flux in a transformer is almost independent of load current.	**04**
	(c)	Two single-phase furnaces A and B are supplied at 100 V by means of a Scott-connected transformer combination from a 3-phase 6600 V system. The voltage of furnace A is leading. Calculate the line currents on the 3-phase side, when the furnace A takes 400 kW at 0.707 pf lagging and B takes 800 kW at unity pf.	**07**
Q.2	**(a)**	Justify that under SC test that the core loss is negligible	**03**
	(b)	State and prove the condition from maximum efficiency of a transformer	**04**
	(c)	A 6.6 kV/400 V, 75 kVA single-phase transformer has a series reactance of 12% (0.12 pu). (a) Calculate the reactance in ohms referred to LV and HV sides. (b) Three such transformers are connected in Star-Star, calculate (i) the line voltage and kVA rating, (ii) pu reactance of the bank, (iii) series reactance in ohms referred to HV and LV sides (c) Repeat part (b) if the bank is connected star on HV side and delta on LV side.	**07**
		OR	
	(c)	What is armature reaction in dc machines? How it affects the main flux distribution and how can armature reaction be reduced?	**07**
Q.3	**(a)**	How does the shaft torque differ from the torque developed in 3-phase Induction motor?	**03**
	(b)	In a transmission system the star side of a star/delta transformer is HV side, while in a distribution system the star side is the LV side. Explain	**04**
	(c)	A 240V/120V, 12 kVA transformer has full-load unity pf efficiency of 96.2%. It is Connected as an auto-transformer to feed a load at 360 V. What is its rating and full-load efficiency at 0.85 pf lagging?	**07**
		OR	
Q.3	**(a)**	Draw the phasor diagram of a practical transformer on load at (a) lagging p.f (b) leading p.f (c) u.p. f.	**03**

	(b)	Explain sumpner's method of testing transformers. What are its advantages over OC and SC tests?	**04**
	(c)	An 8 kW, 230 V, 1200 rpm dc shunt motor has Ra = 0.7 W. The field current is adjusted until, on no load with a supply of 250 V, the motor runs at 1250 rpm and draws armature current of 1.6 A. A load torque is then applied to the motor shaft, which causes the Ia to rise to 40 A and the speed falls to 1150 rpm. Determine the reduction in the flux per pole due to the armature reaction.	**07**
Q.4	**(a)**	How do the synchronizing lamps indicate the correctness of phase sequence between existing and incoming Alternators	**03**
	(b)	Define the terms critical resistance and critical speed and bring out their roles in the process of self-excitation in dc machines. What are the conditions for voltage build up in a DC shunt generator?	**04**
	(c)	A 220 V dc generator supplies 4 kW at a terminal voltage of 220 V, the armature resistance being 0.4 W. If the machine is now operated as a motor at the same terminal voltage with the same armature current, calculate the ratio of generator speed to motor speed. Assume that the flux/pole is made to increase by 10% as the operation is changed over from generator to motor.	**07**
		OR	
Q.4	**(a)**	Discuss the any one method of speed control of a dc series motor	**03**
	(b)	Write short notes on Swinburne's test ?	**04**
	(c)	State the assumptions made in the Poitier method and the effect they have on the accuracy of voltage regulation as calculated by this method.	**07**
Q.5	**(a)**	Explain How the direction of a capacitor start Induction motor is reversed?	**03**
	(b)	Explain about crawling and cogging.	**04**
	(c)	A 4-pole dc motor is lap-wound with 400 conductors. The pole shoe is 20 cm long and average flux density over one-pole-pitch is 0.4 T, the armature diameter being 30 cm. Find the torque and gross mechanical power developed when the motor is drawing 25 A and running at 1500 rpm.	**07**
		OR	
Q.5	**(a)**	What are the advantages of slip-ring I M over cage I M?	**03**
	(b)	Explain the working of a DC motor. What is the significance of back e.m.f in DC rnotors?	**04**
	(c)	Explain the operation of single phase induction motor on the basis of double field revolving theory	**07**

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