Sanjay Ghodawat University, Kolhapur 2019-20

Established as State Private University under Govt. of Maharashtra. Act No XL, 2017 EXM/P/09/01

Year and Program:2019-20 **School of Technology** **Department of Electrical Engineering**

Course Code: EET 307.1 **Course Title: Electrical Machine Design (ESE)** **Semester – V**

Day and Date: Tuesday 26/11/19 **Time:** 3hr [10.30am to 1.30pm] **Max Marks: 100**

Instructions:
1) All questions are compulsory.
2) Assume suitable data wherever necessary.
3) Draw neat diagram wherever necessary
4) Figures to the right indicate full marks.

			Marks	Bloom's Level	CO
Q.1	**Solve the following.**				
	a)	Describe the classification of insulating materials used for electrical machines?	07	L_2	CO1
		OR			
	a)	Name the different duties of electrical machines and discuss continuous duty and short time duty in detail?	07	L_1	CO1
	b)	Derive the output equation of three phase core type transformer in terms of core cross section, window area and specific loading.	08	L_3	CO1
		OR			
	b)	Derive the output equation of DC machine in terms of specific loadings.	08	L_3	CO1
Q.2	**Solve the following.**				
	a)	List the factors to be considered for selecting the no. of armature slots and explain the guiding factors for choice of armature slots?	07	L_1	CO1
		OR			
	a)	Explain the effect of choice of selection of number of poles on DC machines?	07	L_4	CO1
	b)	Derive the output equation of three phase induction motor in terms of specific electric and specific magnetic loadings.	08	L_3	CO2
		OR			
	b)	Explain the following terms: i) Specific electric loading ii) Specific magnetic loading	08	L_4	CO2

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Q.3		**Solve any Two**			
	a)	Show that cooling curve in electrical machines is exponential in nature?	08	L_3	CO1
	b)	Determine the dimensions of the core and yoke for a 100 kVA 50 Hz, Single phase core type transformer. A square core is used with distance between the adjacent limbs equal to 1.6 times the width of the laminations. Assume voltage per turn of 14 volts, maximum flux density 1.1 w_b/m^2, window space factor 0.32 and the current density 3 A/mm^2. Take stacking factor = 0.9. Flux density in the yoke to be 80% of flux density in the core	08	L_5	CO1
	c)	Summarize the factors affecting choice of specific magnetic loading in design of induction motors?	08	L_2	CO1
	d)	Find the main dimensions of a 5 h.p., 400V, 3 phase, 50Hz, 1500 synchronous r.p.m. Sq. cage induction motor? *Use the following data:* Average flux density in the air gap = 0.46 w_b/m^2 Average conductor per metre of armature periphery = 22000 Full load efficiency = 83% Full load power factor = 0.84 lagging Appropriate values for additional data required may be assumed.	08	L_5	CO2
Q.4		**Solve any Two**			
	a)	Derive the output equation of synchronous machine in terms of specific loadings.	09	L_3	CO3
	b)	Estimate the kVA rating of a 3-phase, 50 Hz, 2-pole turbo alternator having core length 160 cm, peripheral speed 140 m/sec, ac = 525 per cm and B_{av} = 0.52 W_b/m^2. Assume K_w = 0.955	09	L_5	CO4
	c)	Describe the factors influencing armature design of 3 phase synchronous machine?	09	L_4	CO3
Q.5		**Solve any Two**			
	a)	Explain the construction and various modes of excitation of permanent magnet stepper motor?	09	L_4	CO3

	b)	Sketch the torque-speed characteristics of a Permanent Magnet BLDC motor?	09	L_3	CO4
	c)	Describe the various power controller circuits applicable to switched reluctance motor and explain the operation of any one scheme in detail?	09	L_4	CO4
Q.6		**Solve any Three**			
	a)	Explain the choices for specific magnetic and specific electric loadings of synchronous machine?	06	L_4	CO3
	b)	Describe the factors influencing the length of air gap of 3 phase synchronous machine?	06	L_2	CO2
	c)	Explain in detail about different types of power drive circuits for stepper motor?	06	L_4	CO3
	d)	Explain the construction and working principle of Hybrid Stepper motor?	06	L_4	CO3

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