Reg. No:

Estd : 1995

SETHU INSTITUTE OF TECHNOLOGY, KARIAPATTI

(An Autonomous Institution Affiliated to Anna University, Chennai)

Regulation - 2015

B.E/B.TECH DEGREE END SEMESTER EXAMINATIONS – NOV/DEC 2018

FIFTH SEMESTER

ELECTRICAL AND ELECTRONICS ENGINEERING

15UEE504 – ELECTRICAL MACHINE DESIGN

Duration: 3 Hours	**Maximum: 100 Marks**

PART -- A (10 x 1 = 10 Marks)

(Answer all Questions)

1	The average flux density of ac dc machine. if the max flux density is 0.72 and field form factor is 0.66 is …… **[CO1 – Understanding]** a)0.47 b) 0.8 c) 1 d)0.4
2	Gap contraction factor with slots and no ducts is **[CO1 - Understanding]** a)Kg= 0 b) Kg= 1 c) Kg= Kgs d)Kg=2
3	Real flux density is 2.2 T and permeability is 31.4 x 10 -6 H/m. the magnetic field intensity a)70.063 AT b) 70.063 AT/ m2 c) 70.063 AT /m d) 70.063 AT /m3 **[CO2 - Applying]**
4	MMF for air gap is 3100 AT and MMF for field is 3900 AT. The MMF for iron is a) 3100 AT b) 5000 AT c) 800 AT d) 1000AT **[CO2 - Applying]**
5	Power transformers should be designed to have maximum efficiency **[CO3 - Applying]** a)at one-fourth load (b)at one-half load (c) at or near full load (d)any of the above
6	Yokes with rectangular cross-section are used for **[CO3 - Understanding]** a)small capacity transformers (b) medium capacity transformers c)large capacity transformers d)any of the above
7	The starting torque of a simple squirrel-cage motor is **[CO4 - Remembering]** (a) Low (b) Increases as rotor current rises (c) Decreases as rotor current rises (d) High
8	The crawling in the induction motor is caused by **[CO4 - Understanding]** (a) improper design of the machine (b) low supply voltage (c) high loads (d) harmonics developed in the motor.
9	The frequency of voltage generated in an alternator depends on **[CO5 - Remembering]** (a) number of poles (b) number of poles and rotative speed (c) rotative speed (d) number of poles, rotative speed and type of winding
10	The magnitude of various voltage drops that occur in an alternator, depends on. (a) power factor of the load (b) load current (c) power factor x load current (d) power factor x (load current)^2 **[CO5 - Remembering]**

PART -- B (5 x 2 = 10 Marks) **(Answer all Questions)**			
11.		Show how the specific magnetic and specific electric loadings are interdependent. **[CO1 - Understanding]**	
12.		Identify the guiding factors for the choice of number of poles in a DC machine. **[CO2 - Applying]**	
13.		Define window space factor **[CO3 - Remembering]**	
14.		How the induction motor can be designed for best power factor? **[CO4 - Remembering]**	
15.		Define run away speed in synchronous machines **[CO5 - Remembering]**	
PART -- B (5 x 16 = 80 Marks) **(Answer all Questions)**			
16.	(a)	Illustrate the choice of specific magnetic and electric loading. **[CO1 - Understanding]**	16
		OR	
	(b)	Explain about various duties and ratings of rotating machines and give their respective temperature time curves. **[CO1 - Understanding]**	16
17	(a)	i) Derive the output equation of a d.c machine. **[CO2 - Understanding]**	8
		ii) Explain the various factors that are affected by the selection of number of poles in d.c machines. **[CO2 - Understanding]**	8
		OR	
	(b)	A design is required for a 50 KW, 4 pole, 600 rpm, dc shunt generator, the full load terminal voltage being 220V. If the maximum gap density is 0.83Wb/m^2 and the armature ampere conductors per metre are 30000. Calculate suitable dimensions of armature core to give a square pole face. Assume that the full load armature voltage drop is 3 percent of the rated terminal voltage, and that the field current is 1 percent of rated full load current. Ratio of pole arc to pole pitch is 0.67. **[CO2 - Applying]**	16
18.	(a)	i) Derive the output equation of a three phase transformer **[CO3-Understanding]**	8
		ii) Calculate the core and window area required for a 1000kVA, 6600/400V, 50Hz, single phase core type transformer. Assume a maximum flux density of 1.25 Wb/m^2 and a current density of 2.5 A/mm^2, voltage per turn =30V. window space factor 0.32 **[CO3 - Applying]**	8

		OR	
	(b)	A 250kVA, 6600/400V, 3 phase core type transformer has a total loss of 4800W at full load. The transformer tank is 1.25m in height and 1m x 0.5m in plan. Design a suitable scheme for tubes if the average temperature rise is to be limited to 35°C. The diameter of tubes is 50mm and is spaced 75mm from each other. The average height of tubes is 1.05m. Specific heat dissipation due to radiation and convection is respectively 6 and 6.5 W/m^2-°C. Assume that convection is improved by 35 percent due to provision of tubes. **[CO3 - Applying]**	16
19.	(a)	(i) Derive the output equation of a three phase induction motor **[CO4 - Understanding]**	8
		(ii) Write short notes on design of rotor bars, slots and end rings **[CO4 - Understanding]**	8
		OR	
	(b)	A 90kW. 500V, 50Hz, three phase, 8 pole induction motor has a star connected stator winding accommodated in 63 slots with 6 conductors per slot. The slip ring voltage on open circuit should be 400 volts approximately. Design a suitable rotor winding and state (i) number of slots in rotor, (ii) number of conductors per slot, (iii) coil span, (iv) slip ring voltage on open circuit, (v) full load current per phase in rotor. Assume efficiency of 90 percent and power factor of 0.86. **[CO4 – Applying]**	16
20.	(a)	Derive the output equation of synchronous machine. **[CO5 - Understanding]**	8
		Explain the design of turbo alternator. **[CO5 - Understanding]**	8
		OR	
	(b)	Find main dimensions of 100MVA, 11KV, 50Hz, 150rpm, three phase water whe generator. The average gap density = 0.65Wb/m and ampere conductors per met 40000. The peripheral speed should not exceed 65 m/s at normal running speed order to limit runaway peripheral speed. **[CO5 - Applying]**	16