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ANURAG Engineering College
(An Autonomous Institution)
II B.Tech II Semester Supplementary Examinations, June/July-2024
ELECTRICAL MACHINES - I
(ELECTRICAL AND ELECTRONIC ENGINEERING)

Time: 3 Hours   Max. Marks: 75

Section – A (Short Answer type questions)   (25 Marks)
Answer All Questions

		Course Outcome	B.T Level	Marks
1.	What is the function of compensating winding?	CO1	L1	2M
2.	Explain the classification of DC machines based on the excitation?	CO1	L2	3M
3.	Describe the applications of DC Generators.	CO2	L1	2M
4.	Write the causes of failure of self ecitation.	CO2	L2	3M
5.	Explain the function of no-volt release in a three-point starter.	CO3	L1	2M
6.	List load characteristics of DC Generator	CO3	L2	3M
7.	What is meant by all day efficiency? When it is used	CO4	L1	2M
8.	Explain why OC test is performed on LV side of a single phase transformer?	CO4	L2	3M
9.	Mention any two applications of three-winding transformers.	CO5	L1	2M
10.	Distinguish clearly the difference between a resistive potential divider and Auto-transformer.	CO5	L2	3M

Section B (Essay Questions)
Answer all questions, each question carries equal marks.   (5 X 10M = 50M)

11. A)	i) Explain the constructional features of a machine with brief explanation with each part	CO1	L3	5M
	ii) A 10 kW, 240 V, 6-pole, 1200 r.p.m lap-connected d.c. generator has 500 armature conductors. At rated voltage and current, armature ohmic losses are 200 watts. Compute the useful flux per pole? Take 3 V as the brush drop at full load?			5M

OR

B)	i) Explain with relevant diagrams, the different methods of excitation of DC machines.	CO1	L3	5M
	ii) A separately excited dc generator has armature circuit resistance of 0.22 Ω and a total drop at brushes is 2.5 V. When running at 1200 rpm, it delivers a current of 120 A at 220 V to a load of constant resistance If the generator speed drops to 750 rpm, with field current unaltered, find the current delivered to load.			5M

12. A)	i) What are the losses that occur in dc machines? Derive the condition for maximum efficiency in a dc generator	CO2	L3	5M
	ii) A dc shunt motor is running at 1200 rpm and it has an armature resistance of 0.15 Ω. The current taken by the armature is 60 A when the applied voltage is 220 V. If the load is increased by 30%, find the variation in the speed.			5M

OR

B)	i)	Explain about the open circuit characteristics of a DC generator. Write the necessary equations?		CO2	L3	5M
	ii)	A 4 pole DC Shunt Generator with lap connected armature supplies 5 kilowatt at 230 Volts. The armature and field copper losses are 360 Watts and 200 Watts respectively. Calculate the armature current and generated EMF?				5M

13. A)	i)	Draw and explain speed-torque and torque-current characteristics of (a) a dc shunt motor and (b) a dc series motor.		CO3	L3	5M
	ii)	A 480 V, 20 kW shunt motor takes 2.5 A when running at no-load. Taking the armature resistance to be 0.6 Ω, field resistance to be 800 Ω and brush drop 2 V, find the full-load efficiency				5M

OR

B)	i)	Explain the principle of torque production in a dc motor and derive an expression for it.		CO3	L3	5M
	ii)	A 15 kW, 230 V shunt generator having an armature resistance of 0.15 Ω and a field resistance of 230 Ω delivers full-load at rated voltage and 750 rpm. The machine is now run as a motor while taking 15 kW at 230 V. What is the speed of the motor? Neglect brush contact drop.				5M

14. A)	i)	With neat diagram, explain the various tests conducted on transformer to predetermine the efficiency of the transformer without directly loading the transformer?		CO4	L3	5M
	ii)	In Sumpner's test on two identical transformer rated 500 kVA, 11/0.4 kV, 50 Hz, the wattmeter reading on HV side is 6 kW on rated voltage and on LV side is 15 kW when circulated full load current. Find the efficiency of each transformer on ¾ th load & 0.8 pf lagging. What will be the maximum efficiency of each transformer?				5M

OR

B)	i)	Define efficiency and regulation of single-phase transformer? Derive the condition for maximum efficiency of a transformer.		CO4	L3	5M
	ii)	A single phase 150 kVA transformer has efficiency of 96 % at full load, 0.8 pf and at half load, 0.8 pf lagging. Find maximum efficiency of transformer and corresponding load.				5M

15. A)	i)	Explain the distinguishing features of $Y - Y$ and $\Delta - \Delta$, three phase connections? Compare their advantages and disadvantages		CO5	L3	5M
	ii)	A 3-phase step down transformer takes 18 A when connected to 4400 V mains. The turn's ratio per phase is 12. Neglecting losses find the secondary line voltage, line current and output if the transformer windings are connected in delta / star				5M

OR

B)	i)	What are the advantages of a single three-phase transformer over three single phase transformer banks of the same kVA rating? State the difference between a three-phase transformer bank and a three-phase transformer unit.		CO5	L3	5M
	ii)	Explain about on load and off load tap changers provided in a 3-phase transformers				5M