MUTHAYAMMAL ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University)
Rasipuram - 637 408, Namakkal Dist., Tamil Nadu

MUST KNOW CONCEPTS

MKC

EEE

2021-2022

Course Code & Course Name : 19EED05 & Design of Electrical Apparatus

Year/Sem/Sec : III/VI/B

S.No	Term	Notation (Symbol)	Concept/Definition/Meaning/ Units/Equation/Expression	Units
		Unit-I : Introduction		
1.	Space factor	S_f	The ratio of copper or conductor area to the total winding area.	No Unit
2.	Specific electric loading	ac	The number of armature (or stator)ampere conductors per metre of armature periphery at the air gap	ac/m
3.	Specific magnetic loading	B_{av}	The average flux density over the air gap of a machine is known as specific magnetic loading	Wb/m2
4.	Duty factor	ε	The ratio of heating time to the period of whole cycle	No Unit
5.	Flux density	B	The ration of flux to area	Wb/m2
6.	Total magnetic loading	TML	The total flux around the armature periphery at the airgap.	No Unit
7.	Total electrical loading	TEL	The total number of ampere Conductors around the armature periphery	ac/m
8.	Pole pitch	τ	The pole pitch is defined as peripheral distance between center of two adjacent poles in DC machine.	No Unit
9.	Temperature rise	Q	The losses in the electrical machines are converted into heat and cause the temperature rise in the machine parts.	°C
10.	Insulating materials	-	These materials are used in an electrical machine to provide insulation between parts of different potentials	No Unit
11.	Synchronous Generators		It is the primary source of electrical energy.	No Unit
12.	E.M.F. equation of an of alternator		4.44 kp kd N Φf	No Unit
13.	Distribution Factor	Kd	Kd = sin m(β/2)/m sin(β/2)	No Unit

14.	Winding Factor	KW	KW = KP*Kd	No Unit
15.	Armature Reaction		Effect of armature flux on main field flux	No Unit
16.	Types of Synchronous Machine		Rotating-Armature Type, Rotating-Field Type	No Unit
17.	Pitch factor	Kp	KP = Cos(α/2)	No Unit
18.	Turn		One turn consists of two conductors	No Unit
19.	Coil		One coil may consist of any number of turns	No Unit
20.	Coil -side		One coil with any number of turns has two coil-sides	No Unit
21.	Pole - pitch		the peripheral distance between identical points on two adjacent poles.	No Unit
22.	Coil-span		It's the other name of coil-pitch	No Unit
23.	coil-pitch		The distance between the two coil-sides of a coil is called coil-span	No Unit
24.	Synchronous Generators		It is the primary source of electrical energy.	No Unit
25.	Laminations of core are generally made of		silicon steel	No Unit
		Unit-II : DC Machines		
26.	Apparent flux density	B_{app}	The ratio of total flux in a slot pitch to the tooth area	Wb/m2
27.	Real flux density	B_{real}	The ratio of actual flux in a tooth to the tooth area	Wb/m2
28.	Field form factor	k_f	The ratio of pole arc to pole pitch	No Unit
29.	Peripheral speed	V_a	It's a translational speed that may exist at the surface of the rotor while it is rotating	m/s
30.	Slot loading	S_L	the product of current through each conductor and conductors per slot	No Unit
31.	Frequency	f	The ratio of number of cycles to the seconds	Hz
32.	Airgap length	l_g	Distance between the stator to the rotor	mm
33.	Flux	φ	The ration of mmf to the reluctance	Wb
34.	Slot pitch	Y_s	Sum of the slot width and tooth width	No Unit
35.	Area of the conductor	a_z	The ratio of flow of current in the conductor to the current density	m2
36.	Losses in dc machines		1.Core loss(or) Iron loss 2. Copper loss 3.Mechanical loss	-
37.	Armature reaction	-	Effect of armature flux on main field flux	-
38.	Efficiency of Generator	-	The ratio between the power available at the generator output and the energy	-

			supplied at the generator input	
39.	Compensating Winding	-	Wound series to armature winding to reduce the armature reaction effect.	
40.	Torque Equation of DC motor	-	T=0.159 Φ Ia PZ/A (N-M)	-
41.	Angular speed	ω	In the case of uniform circular motion, the average and instantaneous values are equal.	-
42.	Applications of DC shunt motor	-	1. Lathe machines. 2. Drills. 3. Lifts 4. Fans. 5. Boring mills.	-
43.	Applications of DC series motor	-	1. Electric traction. 2. Electric footing. 3. Cranes. 4. Lifts.	-
44.	Applications of DC compound motor	-	1. Electric shovels. 2. Reciprocating machine. 3. Conveyors. 4. Stamping machine.	-
45.	Types of Braking	-	1. Rheostatic or dynamic braking 2. Plugging or reverse current braking 3. Regenerative beaking.	-
46.	Len's Law	-	When an EMF is induced in a circuit electromagnetically the current set up always opposes the motion or change in current which produces it.	-
47.	Force in a Conductor	F	F = BIl newtons (N)	Newton
48.	Types of D.C. Motors	-	1. DC Shunt motor 2. DC Series motor 3. DC Compound motor	-
49.	Speed of shunt motor	N	$N = \frac{v_a - i_a r_a}{k\phi}$	rpm
50.	Torque Equation of DC motor	-	T=0.159 Φ Ia PZ/A (N-M)	-
Unit-III : Transformers				
51.	Regulation	R	The ratio of change in secondary terminal voltage between no load and full load conditions to the secondary no load voltage	No Unit
52.	Efficiency	η	The ratio of output power to the input power	No Unit
53.	Iron loss	P_i	Iron losses are caused by the alternating flux in the core of the transformer as this loss occurs in the core it is also known as Core loss.	Watts
54.	copper losses	P_c	Copper loss is the term often given to heat produced by electrical currents in the conductors of transformer windings, or	watts

			other electrical devices	
55.	Area of yoke	A_y	The product of depth of yoke and height of the yoke	m2
56.	Number of turns in primary winding	T_p	The ratio of Voltage of primary winding to the voltage per turn	No Unit
57.	Transformer tank	-	The transformer core and winding assembly is placed inside a container is called transformer tank.	No Unit
58.	Temperature rise with tubes	θ	$\theta = \frac{P_i + P_c}{(12.5 + 8.8x)S_T}$	°C
59.	Total area of the tubes	-	$= xS_T$ *where as* S_T − *surface area of the tank*	m2
60.	Area of each tube	a_t	$= \pi d_t$ where as ι- *diameteroif tul* - length of the tube	m2
61.	Auto Transformer	-	The primary and secondary windings of a two winding transformer have induced emf in them due to a common mutual flux and hence are in phase.	-
62.	Buchholz relay	-	Protection of transformers from the faults occurring inside the transformer	-
63.	Transformers are rated in kVA	-	Copper loss of a transformer depends on current and iron loss on voltage . Hence total losses depend on Volt- Ampere and not on the power factor. That is why the rating of transformers are in kVA and not in kW.	-
64.	Typed of tap changing transformer	-	On load tap changers Off load tap changers	-
65.	Functions of no-load current in a transformer	-	No-load current produces flux and supplies iron loss and copper loss on no-load.	-
66.	The reasons for parallel operation of transformer	-	1. Non-availability of a single large transformer to meet the total load requirement. 2. The power demand might have increased over a time necessitating augmentation of the capacity.	-
67.	Types of winging in transformer	-	1.Primar winding 2. Secondary Winding	-
68.	Induction Law	-	The voltage induced across the secondary coil may be calculated from Faraday's law of induction, which states that.	-
69.	All day efficiency of a transformer	-	It is the computed on the basis of energy consumed during a certain period , usually a day of 24 hrs. ηall day = output in kWh /input in kWh for 24 hrs.	-

70.	Silicon steel	-	Material used for construction of transformer core is usually	-
71.	Use of oil	-	A transformer oil must be free from Moisture	-
72.	Generator transformers	-	Generator transformers are employed in generating stations to connect the power station to the transmission system.	-
73.	Welding transformer	-	Is special type of transformer which is basically a step-down transformer.	-
74.	EMF equation of transformer	E	4.44fQmTph	Volt
75.	Electric Braking	-	A running motor may be brought to rest quickly by either mechanical braking or electrical braking.	-
Unit-IV : Induction Motor				
76.	Dispersion co efficient	σ	The ratio magnetizing current to the ideal short circuit current	No Unit
77.	Stator slot pitch	y_{ss}	The distance between centers of two adjacent stator slots in linear scale measurement	No Unit
78.	Synchronous speed	N_s	$N_s = \frac{120\,f}{p}$	rpm
79.	Slip	S	The ratio of slip speed to synchronous speed	No Unit
80.	Pole pitch	τ	$\tau = \frac{\pi D}{p}$	No Unit
81.	Output equations	Q	$Q = C_0 D^2 L n_s$	KVA
82.	Output coefficient	C_0	$C_0 = 11 B_{av} ac Kws X 10^{-3}$	No Unit
83.	Stator winding turns per phase	T_{ph}	$T_{ph} = \frac{E_s}{4.44 f \varphi K_{ws}}$	No Unit
84.	Total number of stator conductors	Z_s	$Z_s = 6T_{ph}$	m
85.	Number of stator slots	S_s	Number of phases(m) X poles (p)X stator slots per phase per pole (qs)	No Unit
86.	Starting torque of Squirrel cage motor	-	Low	-
87.	Starting Current Slip ring Motor	-	Low	-
88.	Maintenance Squirrel cage motor	-	Almost ZERO Requires maintenance	-
89.	Laminations of core are generally made of	-	Silicon steel	-
90.	Why the armature of D.C. generator is laminated	-	To reduce eddy current loss	-
91.	The resistance of armature winding depends on	-	Length of conductor, cross-sectional area of the conductor, number of conductors	-

92.	Field coils of D.C. generator	-	Is made up of Copper	-
93.	Copper lugs	-	Used to connected commutator segments are to the armature conductors	-
94.	Eddy current losses	-	Reduced by laminated core	-
95.	Stator core	-	Usually fabricated out of silicon steel	-
96.	Cast iron	-	Used to made up of Frame is an induction motor	-
97.	Stiff	-	Shaft is of an induction motor	-
98.	Slip of Medium size motor	-	Around 4%	-
99.	Rotor slots are slight skew	-	Reduce magnetic hum	-
100.	Power factor will decrease	-	In case the air gap in an induction motor is increased	-
		Unit-V : Synchronous Motor		
101.	Output equations	Q	$Q = C_0 D^2 L n_s$	KVA
102.	Output coefficient	C_0	$C_0 = 11 B_{av} ac K ws X 10^{-3}$	No Unit
103.	Peripheral speed	V_a	$= \pi D n_s$	m/sec.
104.	Current flow	-	$I_s = I_{ph}$ $star\ connected$ $I_s = \frac{I}{ }$delta connected	A
105.	Runaway speed	-	The speed at which prime mover will run when its rated load is suddenly thrown off	Rpm
106.	Stator winding turns per phase	T_{ph}	$T_{ph} = \frac{E_s}{4.44 f \varphi K_{ws}}$	No Unit
107.	Total number of stator conductors	Z_s	$Z_s = 6T_{ph}$	m
108.	Short Circuit Ratio	SCR	Reciprocal of synchronous reactance	No Unit
109.	Pitch factors	K_p	The ratio of induced emf in a short pitch coil to the emf induced in a full pitch coil	No Unit
110.	Distribution factors	K_d	The ratio of induced emf in a distributed winding to the emf induced in a concentrated winding	No Unit
111.	V Curve	-	If graph of armature current drawn by the motor (Ia) against field current (If)	-
112.	Under excitation	-	The field excitation is such that Eb < V.	-
113.	Normal excitation	-	The motor is said to be normally excited if the field excitation is such that Eb = V	-
114.	Over excitation	-	The motor is said to be overexcited if the field excitation is such that Eb > V	-
115.	Hunting	-	Sudden changes of load on synchronous motors set up oscillations	-

116.	Synchronous Induction Motor	-	It has high starting torque and constant speed	-
117.	Method of starting in synchronous motor	-	1.Pony Motor 2.Demper winding 3. As a slip ring induction motor 4. Using small size dc motor	-
118.	Back emf in case of synchronous motor depends on the	Eb	Excitation given to the field winding	Volts
119.	Synchronous Motor	-	It can operate conveniently on lagging as well as leading power factor	-
120.	A synchronous motor will always stop when	-	Excitation winding gets disconnected	-
121.	Synchronizing power of a synchronous machine is	-	Inversely proportional to the synchronous reactance	-
122.	Phase advancer	-	A synchronous motor working at leading power factor can be used as phase advancer	-
123.	Power factor of a synchronous motor is unity	-	When the armature current is minimum	-
124.	Stability of a synchronous machine	-	Increases with increase in its excitation	-
125.	Pole faces	-	Damper windings are provided on pole faces of synchronous motor	-
Placement Questions				
126.	Free from mechanical and magnetic vibrations	-	Hysteresis motor	-
127.	A reluctance motor	-	is self-starting, constant speed motor, needs no D.C. excitation	-
128.	portable drills motor is	-	universal motor	-
129.	The motor used for the compressors	-	capacitor-start capacitor-run motor	-
130.	In a universal motor brush sparking is	-	open armature winding, shorted armature winding, shorted field winding, high commutator mica	-
131.	A repulsion motor is equipped with	-	commutator	-
132.	A pony motor is basically a	-	small induction motor	-
133.	A three-phase synchronous motor will have	-	two slip-rings	-
134.	salient pole type machines	-	synchronous motors	-
135.	Load angle	-	It depends the of back e.m.f. of a synchronous motor	-
136.	synchronous motor can operate at	-	lagging, leading and unity power factors	-
137.	mild steel	-	The shaft of synchronous motor is made up of it.	-

138.	Synchronous motors are	-	not-self starting	-
139.	Slip rings are usually made of	-	brass or steel	-
140.	Stability of a synchronous machine	-	increases with increase in its excitation	-
141.	A rotary converter can also be run as a	-	synchronous motor	-
142.	V-curves represent relation between	-	armature current and field current	-
143.	Exciters of synchronous machines are	-	d.c. shunt machines	-
144.	66 kV	-	The undergroud system cannot be operated.	-
145.	Galvanized steel wire is generally used as	-	stay wire, earth wire, structural components	-
146.	The usual spans with R.C.C. poles are	-	80—100 meters	-
147.	Transmission line insulators are made of	-	porcelain	-
148.	crawling	-	harmonics developed in the motor	-
149.	Slip of an induction motor is negative when	-	rotor speed is more than the synchronous speed of the field and are in the same direction	-
150.	Low voltage at motor terminals is due to	-	inadequate motor wiring, poorly regulated power supply	-

Faculty Team Prepared **Signatures**

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