SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583
QUESTION BANK (DESCRIPTIVE)

Subject with Code : Electrical Technology (16EE212) **Course & Branch**: B.Tech & ECE

Year &Sem: II-B.Tech & II-Sem **Regulation:** R16

UNIT –I

DC GENERATORS

1		Explain with a neat sketch the Working principle of operation of D.C generator?	12M
2		Enlist the essential parts of a D.C. machine and indicate their functions.	12M
3	a	Derive the e.m.f. equation of the DC generator.	6M
	b	A 4 pole shunt generator with lap connected armature having field and armature resistances of 50Ω and 0.1Ω respectively, supplies 100V, 40 watts of 60 lamps. Calculate the total armature current, armature current per armature path and the generated emf. Allow a constant drop of 1V per brush.	6M
4	a	Explain how voltage builds up in D.C shunt generator.	6M
	b	A 4 pole lap wound generator has 56 coils and 6 turns per coil. The speed is 1150 rpm. What must be the flux per pole in order to generate an induced emf of 265V. How many commutator bars are required for generator.	6M
5		Derive the voltage – current relations of separately and self excited D.C. generator with neat sketch.	12M
6	a	Describe the different types of generator.	4M
	b	A 4-pole DC compound generator has armature, series field and shunt field resistances of 1Ω, 0.5Ω and 100 Ω respectively. This generator delivers 4kW at a terminal voltage of 200V and Allow 1V per brush for contact drop. Calculate the induced e.m.f for both long shunt and Short shunt.	8M
7	a	Deduce an expression induced e.m.f. in the armature of a d.c. generator.	6M
	b	A 4-pole lap wound DC series generator has flux per pole of 3m wb and 720 armature coils with 6 turns per coil. If the armature and series field resistances of 0.75Ω and 0.05Ω respectively. Calculate the terminal voltage by delivering a load of 75A and running at a speed of 1000rpm. Take total brush voltage drop of 2V.	6M
8	a	Explain the terms “critical field resistance” and “critical speed” of a D.C. shunt generator with reference to relevant characteristic.	8M
	b	Write short note on applications of various types of DC Generator.	4M

9		Draw and explain magnetization and load characteristics of DC shunt generator.	12M
10		Draw and explain the load characteristics of series, shunt and compound generators.	12M

UNIT-II

DC MOTORS

1		Write down the principle of operation of DC motor.	12M
2	a	Deduce an expression for torque developed in the armature of DC motor.	6M
	b	A 120V DC shunt motor has armature and shunt field resistances of 0.2Ω and 60Ω it runs at 1800 rpm when it takes full load current of 40A. Find the speed of motor while it is operating at half full load, terminal voltage remaining the same.	6M
3	a	Derive the condition for maximum efficiency of a DC machine.	6M
	b	Determine armature and shaft torque of 220V, 4 Pole DC Series motor with 800 conductors wave connected supplying a load of 8.2kw by taking 45A from the mains, the flux / pole is 25mwb and its armature and series field resistance is 0.6Ω.	6M
4		What are the different losses in a DC machine? Which of them are variable losses? Derive the condition for maximum efficiency of a DC machine.	12M
5		Draw and explain the characteristics of series, shunt and compound Motors.	12M
6		Describe how Swinburne's test is conducted on DC machine. State its advantages and disadvantages.	12M
7		Draw and explain the nature of speed – torque and torque – current characteristics of: (i) Shunt Motors. (ii) Series Motors.	12M
8		Explain various speed control methods of a DC Shunt motor with neat sketches.	12M
9	a	State the necessity for a starter in DC motors and also draw the schematic diagram of 3-Point Starter.	6M
	b	List the different application of DC Motor.	6M
10	a	Deriving the necessary expressions, explain how to predetermine the efficiency of a d.c shunt motor.	8M
	b	Why a series motor cannot be started on no load?	4M

UNIT –III

SINGLE PHASETRANSFORMERS

1		Draw and explain the constructional features of a single phase transformer.	12M
2	a	Explain the working principle of operation of single – phase transformer.	6M

	b	A 3000/200V, 50Hz single phase transformer is built on a core having an effective cross sectional area of 150 sq.cm and have 80 turns in low voltage winding. Calculate (i) the value of maximum flux density (ii) the no.of turns in HV winding.	6M
3	a	Derive the EMF equation of a single-phase transformer.	6M
	b	A 2200/250V transformer takes 0.5A and power factor of 0.3 on open circuit. Find the Magnetizing and working components of no load primary current. Also draw no load phasor diagram.	6M
4	a	Explain briefly operations of transformer on load. Also draw phasor diagram for R & L loads.	8M
	b	Difference between Core type and Shell type transformer.	4M
5		Draw the equivalent circuit parameters of a single-phase transformer.	12M
6	a	Explain the various losses in a transformer and derive the condition for maximum efficiency of a transformer.	6M
	b	A 20KVA, 2000v / 200v 1-phase transformer has the following parameters: HV winding: $R_1 = 3\Omega$, $X_1 = 5.3\Omega$ LV winding $R_2 = 0.05\Omega$ $X_2 = 0.1\Omega$ (i) Find voltage regulation at UPF, 0.8 Lag pf & 0.707 Lead pf. (ii) At what power factor regulation is Zero & Maximum.	6M
7		Explain the O.C & S.C tests on single-phase transformer with neat circuit diagram.	12M
8	a	Deduce an expression for the EMF induced of a single-phase transformer.	6M
	b	In a transformer, the core loss is found to be 52 W at 40 Hz and 90 W at 60 Hz; both losses being measured at the same peak flux density. Compute the hysteresis and eddy current losses at 50 Hz.	6M
9	a	Define voltage regulation of a transformer and also derive the condition for maximum voltage regulation.	5M
	b	The Iron and full load copper losses in 40 KVA single phase transformer are 450 W and 850 W respectively. Find (i) Efficiency at 3/4th full load when the power factor of load 0.8 Lag. (ii) The load KVA at which maximum efficiency occurs. (iii) The Maximum Efficiency at 0.8 p.f lagging.	7M

10		The following readings were obtained from OC and SC tests on 2KVA, 115V / 230V, 50Hz transformer OC test on LV side : 115V, 1.1A, 50W SC test on HV side : 13V, 8.7A, 100W (i) Draw the Equivalent circuit referred to primary (ii) Calculate the Regulation and efficiency at $3/4^{th}$ full load and 0.8 Lag pf.	12M

UNIT-IV

3 – PHASEINDUCTION MOTORS

1	a	Explain the constructional details of 3phase induction motor.	7M
	b	A 6-pole, 50 Hz induction motor has a slip of 2.5%. Find the actual speed and slip speed.	5M
2	a	Explain the principle of operation of Induction motor.	8M
	b	Explain why the rotor of 3-phase induction motor can never attain synchronous speed.	4M
3	a	Explain the effect of slip on rotor emf and rotor frequency.	6M
	b	Two 440 V, 50 Hz, 4 pole, 3-phase induction motor, running at 950 rpm and 715 rpm respectively. Determine which of the two motors is running at higher slip.	6M
4	a	Explain the torque slip characteristics of 3-phase induction motor.	6M
	b	A 50 Hz, 8 pole induction motor has a full load slip of 4%. The rotor resistance and reactance are 0.01Ω and 0.01Ω per phase respectively. Find the ratio of maximum to full load torque and speed at which the maximum torque occurs.	6M
5	a	Derive the expression for the rotor e.m.f and rotor current of an induction motor.	6M
	b	The rotor resistance and stand still reactance per phase of a 3-phase slip ring induction motor are 0.02Ω and 0.1Ω respectively. What should be the value of the external resistance per phase to be inserted in the rotor circuit to give maximum torque at starting?	6M
6	a	Derive torque equation of 3-phase induction motor under running condition.	6M
	b	A 4 pole 3-phase induction motor operated from a 50 Hz supply system. If the machine runs at 3% slip on full load. Calculate (i) The rotor speed (ii) The frequency of the rotor current and (iii) the frequency of the rotor current at standstill.	6M
7	a	Derive condition for maximum torque under running condition.	6M
	b	A 3-phase induction motor is wound for 4 poles and is supplied from 50 Hz system. Calculate (i) The synchronous speed (ii) The speed of the motor when slip is 4% and (iii) The rotor current frequency when the motor runs at 600 rpm.	6M
8	a	Explain why the rotor of 3-phase induction motor can never attain synchronous speed.	4M

	b	Explain the torque slip characteristics of 3-phase induction motor.	8M
9	a	Obtain the expressions for starting torque and maximum torque ratio of a three phase induction motor.	6M
	b	Obtain the expressions for full load torque and maximum torque ratio of a three phase induction motor.	6M
10		A 400 V, 4 pole, 3 phase, 50 Hz star connected induction motor has a rotor resistance and reactance per phase equal to 0.01Ω and 0.1Ω respectively. Determine i) starting torque ii) slip at which maximum torque will occur iii) speed at which maximum torque will occur iv) maximum torque v) full load torque if full load slip is 4%. Assume ratio of stator to rotor turns as 4.	12M

UNIT-V

SYNCHRONOUS MACHINES

1	a	Explain the working principle of a three-phase alternator.	6M
	b	For a 3-phase winding with 4-slots per pole per phase and with the coil span of 10 slots, evaluate the pitch and distribution factor.	6M
2	a	Explain the constructional features of 3-Ø alternators with the help of neat diagrams.	6M
	b	A 3 Ø 4-pole, 24 slot alternator has its armature coils short pitched by one slot. Find (i) Pitch factor (ii) Distribution factor.	6M
3	a	Obtain the expression of EMF induced in an alternator.	6M
	b	A 4pole alternator has an armature with 25 slots and 8 conductors per slot and rotates at 1500 rpm and the flux per pole is 0.05 wb. Calculate the EMF generated, if winding factor is 0.96 and all the conductors in a phase are in series.	6M
4	a	Explain the working principle of an alternator.	6M
	b	A three phase star connected alternator driven at 750 rpm is required to generate a line voltage of 4000 volts at 50 Hz on open circuit. The slots has 3 slots/pole/phase and 12 conductors/slot. Calculate: i) Number of poles ii) the useful flux per pole. Assume full pitch coil.	6M
5	a	Derive the EMF equation for an alternator.	6M
	b	A 200kVA, 415 V, 50 Hz, 3 Ø alternator has effective armature resistance of 0.01Ω and an armature leakage reactance of 0.05Ω. Compute the voltage induced in the armature winding when the alternator is delivering rated current at a load p.f of (i) 0.8 Lagging (ii) 0.8 leading.	6M

6		Explain the Synchronous impedance method for calculating the regulation of a three phase alternator.	12M
7	a	Explain the working principle of operation of a synchronous motor.	6M
	b	A 3-phase, 16 pole alternator has 144 slots with 4 conductors/slot, the winding being double layer winding. Flux in the air gap is 50 mwb sinusoidally distributed. The coil span is 150^0 (electrical). Find the EMF generated when the alternator shaft is driven at 375 rpm.	6M
8		Sketch and explain the open circuit and short circuit characteristics of a synchronous machine. How voltage regulation can be calculated by the use of their results.	12M
9		A 3-phase, 50 Hz, star connected 200 KVA, 2300V alternator has an effective resistance of 0.12Ω and gives a short circuit current of 600A for a certain field excitation. With the same excitation, the open circuit voltage was 900V. Calculate: i) The synchronous impedance and reactance ii) The full load regulation when the power factor is 0.8 lagging iii) The full load regulation when the power factor is 0.6 leading.	12M
10	a	Explain the theory of operation of a synchronous motor.	6M
	b	A 550 V, 50 KVA single phase alternator has an effective resistance of 0.2Ω. A field current of 10A produces an armature current of short circuit and an emf of 450 V of open circuit. Calculate i) Synchronous impedance and reactance ii) The full load regulation when the power factor is 0.8 lagging.	6M

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