17GEX01 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING				
Academic Year :	2017-2018	**Question Bank**	Programme	B.E – CIVIL,MECH
Year / Semester :	I / II		Course Coordinator:	Dr.T.SURESH PADMANABHAN

Course Objectives	**Course Outcomes**
1. To introduce basic electrical terminologies and laws 2. To impart knowledge on solving series and parallel circuits 3. To introduce about the three phase system 4. To explain the working principle of dc and ac machines, power plants 5.To familiarize about basic electronic components, circuits, transducers, digital logic and communication systems	On the successful completion of the course, students will be able to CO1: Remember the basic laws and fundamental concepts related to electrical, electronics and communication engineering CO2: Apply basic concepts to solve problems in DC and AC circuits CO3: Recall the principle of operation of DC, AC machines and power plants CO4: Summarize the Boolean algebra and digital logic gates CO5: Elucidate the characteristics of diode, BJT and applications of amplifiers and oscillators CO6: Explain the operation of functional blocks of various communication systems

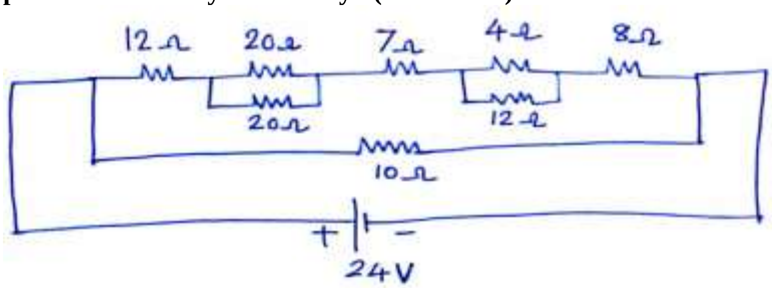
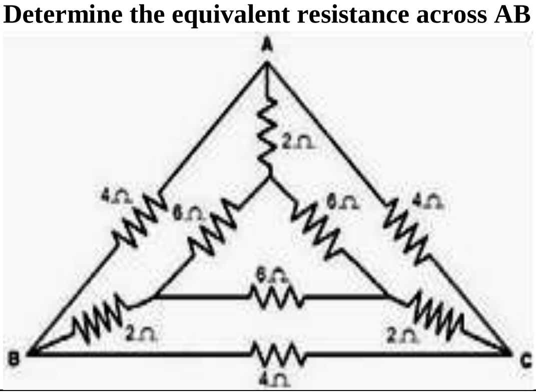
PART – A (2 Mark Questions With Key)

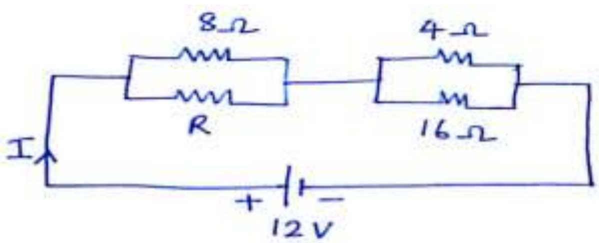
S.No	Questions	Mark	COs	BTL
	UNIT I – DC AND AC CIRCUIT FUNDAMENTALS			
1	**What are the limitations of Ohms law?**		1	K1
	i. Ohm's law does not apply to all non metallic conductors. ii. It does not also apply to nonlinear device such as zener diode, vacuum tubes etc. iii. Ohm's law is true for metal conductors at constant temperature. If the temperature changes, the law is not applicable.	1 1		
2	**Define current.**			
	The flow of free electrons in a metal is called electric current. The unit of current is ampere. Electric current is defined as rate of flow of electric charge. $I = dq / dt$ amperes Where q is the charge in coulombs	1 1	1	K1
3	**Define voltage.**			
	Voltage at a point is defined as a work done by a unit positive charge, which is moving from infinite point to that point against the applied electric field. The unit of voltage is the volt. Voltage represented by V.	1 1	1	K1
4	**Define power.**			
	The rate of doing work by electrical energy or energy supplied per unit time is called the power. Its unit is watts. $P = VI$; $P = I^2R$; $P = \frac{V^2}{R}$. $P = \frac{Energy}{time}$	1 1	1	K1
5	**Define resistance.**			
	Resistance is the property of a substance, which opposes the flow of electric current. Also it can be considered as electric friction. Whenever current flows through a resistor, a voltage drop occurs in it and it is dissipated in the form of heat. Unit of resistance is ohm. Symbol is Ω and measured with a help of ohmmeter	1 1	1	K1

6	**Two resistors of 10 ohms and 15 ohms are connected in (i) series and (ii) parallel. Find the equivalent resistance in each case.**			
	(i) Series connection: R=R1+R2 = 10+15 = 25 ohms (ii) Parallel connection: R=R1 R2/ (R1+R2) = 10x15/(10+15) = 6 ohms	1 1	2	K3
7	**Give the meaning of electrical energy.**			
	Energy is the total amount of work done and hence is the product of power and time. $W = P\,t = V\,I\,t = I^2\,R\,t = \frac{V^2}{R}t$ watt-second Bigger unit of electrical energy is **Unit** (1 unit = 1 kw-hour)	1 1	1	K1
8	**Write down the expression for effective resistance when three resistances are connected in series and parallel.**			
	For series connection (for three resistors) a. **R= R1 + R2 +R3** For parallel connection (for three resistors) b. $1/R = 1/R1 + 1/R2 + 1/R3$	1 1	1	K1
9	**State Kirchhoff's laws.**			
	Kirchhoff's current law At a junction, the sum of currents flowing towards the junction is equal to the sum of the currents flowing away from it. **Kirchhoff's voltage law** In a closed circuit, the sum of the potential drops are equal to the sum of the potential rises.	1 1	1	K1
10	**State Ohm's law.**			
	When temperature remains constant, the current flowing through a conductor is directly proportional to the potential difference across the conductor. $I \; \alpha \; V$ $V = IR$	1 1	1	K1
11	**Define form factor.**			
	Form factor is defined as the ratio of RMS value to the average value. Form factor = $\frac{\text{RMS } value}{Average\ value}$	1 1	1	K1
12	**Define crest (peak) factor.**			
	Peak or crest factor is defined as the ratio of peak value to the RMS value. Crest (peak) factor = $\frac{\text{peak } value}{\text{RMS } value}$	1 1	1	K1
13	**Define power factor.**			
	The power factor is the cosine of the phase angle between voltage and current. Cos ɸ = Resistance / Impedance Cos ɸ = Real Power / Apparent power	1 1	1	K1
14	**Differentiate rms and average value. (DEC. 2017)**			
	(see table below)	1 1	1	K1

rms value	average value
It is the mean of the squares of the instantaneous value of current over one complete cycle.	It is the mean or average of the instantaneous values of current over one complete cycle.
RMS value =	AVG. value = $\frac{area \text{ of the curve}}{base}$

	$\sqrt{\frac{area\ of\ the\ squared\ curve}{base\ or\ time\ period}}$				
	For a sinusoidal waveform, rms value= 70.7% of peak value	For a sinusoidal waveform, avg value= 63.6% of peak value			
15	**Define reactive power.**				
	It is defined as product of the applied voltage and the reactive component of the current. It is also called as imaginary component of the apparent power. It is represented by *"Q"* and it is measured in unit volt-ampere reactive (VAR). Q= V I sin Ө		1 1	1	K1

PART – B (12 Mark Questions with Key)				
S.No	**Questions**	**Mark**	**COs**	**BTL**
UNIT-I – DC AND AC CIRCUIT FUNDAMENTALS				
1	**Distinguish between series and parallel circuits.** **Explain current and voltage division rules with examples.**	6 3+3	1	K2
	Comparison	6		
	Current division rule	3		
	Voltage division rule	3		
2	**Find the total resistance of the given circuit. Also find the total current and power delivered by the battery. (DEC. 2017)** 	12	2	K3
	series resistance = 12+10+7+3+8= 40 ohms 40 ohms in parallel with 10 ohms = 8 ohms Total resistance = 8 ohms	4 2		
	Total current = I= V/R =24/8= 3A	3		
	Total power = P =VI = 24 x 3= 72 W	3		
3	**Determine the equivalent resistance across AB of the circuit shown below.** 	12	2	K3
	Inner 6 ohms delta to star --- 2ohms star network	3		

	Inner 2 ohms series with 2 ohms ---- 4 ohms Inner 4 ohms star to delta ------- 12 ohms delta network 4 ohms and 12 ohms in parallel ---- 3 ohms ; Final 3 ohms delta network R_{AB} = 3 ohms parallel with 6 ohms = 2 ohms	2 3 2 2		
4	**A series RC circuit with R =20 ohms and C = 127 microfarad has 160 V, 50 Hz supply connected to it. Find the circuit impedance, admittance, current, voltage across different elements, power, power factor, reactive and apparent power.**	12	2	K3
	$X_C = 1/2\pi fC$ = 25 ohms Z= SQRT ($R^2 + X_C^2$) = 32 ohms Y= 1/Z = S I= V/Z= 5 A V_R= I R = 100 V $V_C = I X_L$ = 125 V S = VI = 800 VA Power factor = R/Z= lead P= VI cosθ = W Q= V I sinθ = VAR	1 2 1 1 1 1 1 2 1 1		
5	**A 100 ohm resistor and a 20 mH inductor are connected in series across a 230 V, 50 Hz supply. Find the circuit impedance, admittance, current, voltage across different elements, power, power factor, reactive and apparent power.**	12	2	K3
	$X_L = 2\pi fL$ = 6.283 ohms Z= SQRT ($R^2 + X_L^2$) = 100.197 ohms Y= 1/Z = 9.98 X 10^{-3} S I= V/Z= 2.295 A V_R= I R = 229.5 V $V_L = I X_L$ = 14.42 V S = VI = 527.85 VA Power factor = R/Z= 0.998 lag P= VI cosθ = 526.7 W Q= V I sinθ = VAR	1 2 1 1 1 1 1 2 1 1		
6	**In the given circuit, the total power delivered by the battery is 18 W. Calculate the value of unknown resistance R and its current.**  		2	K3
	Total current = P/V = 18/12 = 1.5 A Total resistance = V/I= 12/1.5= 8 ohms	2 2		
	Total resistance = 8 parallel with R + 4 parallel with 16 = 8 8R/(8+R) + 3.2= 8 ; R= 12 ohms	4		
	I in 12 ohm resistor = 1.5 x 8 /(8+12) = 0.6 A	4		

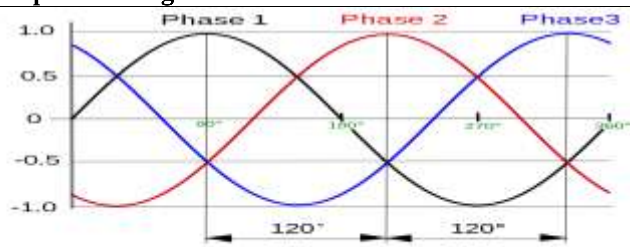
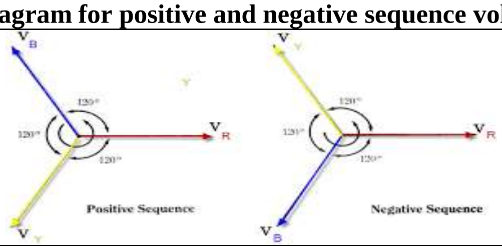
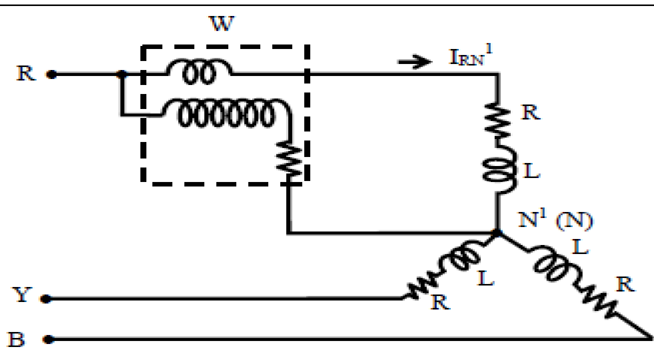
PART – C (20 Mark Questions with Key)				
S.No	**Questions**	**Mark**	**COs**	**BTL**
UNIT-I – DC AND AC CIRCUIT FUNDAMENTALS				

1	**Determine the rms value, average value, form factor and peak factor for the (i) Full rectified sine wave and (ii) half rectified sine wave**	20	2	K3
	Full rectified sine wave: rms value calculation average value calculation form factor calculation peak factor calculation	 3 3 2 2		
	Half rectified sine wave: rms value calculation average value calculation form factor calculation peak factor calculation	 3 3 2 2		
2	Calculate the total power and energy consumption of your house with suitable assumptions and also calculate the bimonthly electricity bill with cost of 2 Rs/unit	20	2	K3
	List of loads with power rating and numbers (with assumptions- min. of 5 loads)	5		
	Table of power and energy calculation	10		
	bimonthly electricity bill calculation	5		

UNIT II – THREE PHASE SYSTEM

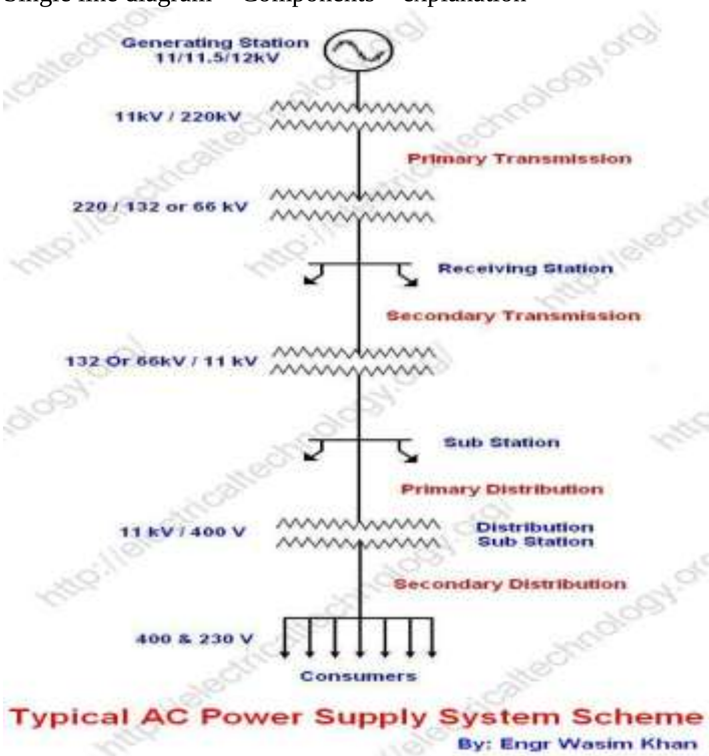
PART – A (2 Mark Questions With Key)

S.No	Questions	Mark	COs	BTL
1	**What is phase sequence?**		1	K1
	Phase sequence of a poly phase system is the order in which the different phase quantities reach their maximum values.	2		
2	**Give the relationship between the line and phase values in star connection.**			
	The relation between line voltage and phase voltage in a star connection is $V_L = \sqrt{3}V_{ph}$ The relation between line current and phase current in a star connection is $I_L = I_{ph}$	1 1	1	K1
3	**Give the relationship between the line and phase values in delta connection.**			
	The relation between line voltage and phase voltage in a delta connection is $V_L = V_{ph}$ The relation between line current and phase current in a star connection is $I_L = \sqrt{3}I_{ph}$	1 1	1	K1
4	**What are the methods of connections of 3Ø windings?**			
	(1)Independent connection (2)Star connection (3) Delta connection	2	1	K1
5	**List the advantages of three phase system over single phase system.**			
	Generation, transmission and distribution of 3 Phase power is more economical Three phase machines have better power factor and efficiency Three phase motors are self-starting For same size, the capacity of 3 phase machine is high	2	1	K1
6	**Define balanced supply and unbalanced supply.**			
	The three phase supply is said to be balanced when all three phase voltages are equal in magnitude and separated by 120˚ each other. Otherwise the system is said to be an unbalanced one.	2	1	K1
7	**Define balanced load and unbalanced load.**			
	The three phase load is said to be a balanced load when all the three load impedances are identical and hence the load current in all three phases are equal in magnitude and separated by 120˚ each other. Otherwise the load is said to be an unbalanced one.	2	1	K1
8	**List the main components of AC transmission and distribution system.**			
	Transformers Transmission lines Insulators Protective devices	2	3	K1
9	**Give the merits and demerits of single wattmeter method.**			

	Merit: only one watt meter is used Demerit: For unbalanced load single watt meter method doesn't give the correct three phase power value.	1 1	1	K1
10	**List the merits of measuring three phase power using two wattmeter method.**			
	1)Only two wattmeter are sufficient to measure three phase power 2)Suitable for both balanced and unbalanced star and delta loads 3)Using two wattmeter readings , it is possible to find total power, power factor and reactive power of the load.	2	1	K1
11	**Draw the three phase voltage waveform**			
		2	1	K1
12	**Draw the phasor diagram for positive and negative sequence voltages.(DEC. 2017)**			
		1 1	1	K1
13	**Write the equations for three phase power and powerfactor measured using two wattmeter method.**			
	Three phase power= W1+W2 Power factor = $\cos\varphi = \cos[\tan^{-1}(\sqrt{3}\frac{W1-W2}{W1+W2})]$	1 1	1	K1
14	**Circuit diagram for three phase power measurement using single wattmeter method for balanced star connected load**			
		2	1	K1
15	**What is meant by one line diagram?**			
	One-line diagram or single-line diagram (SLD) is a simplified notation for representing a three-phase power system. Electrical elements such as circuit breakers, transformers, capacitors, bus bars, and conductors are shown by standardized schematic symbols. Instead of representing each of three phases with a separate line or terminal, only one conductor is represented.	2	1	K1

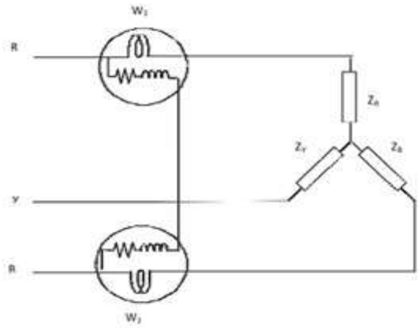
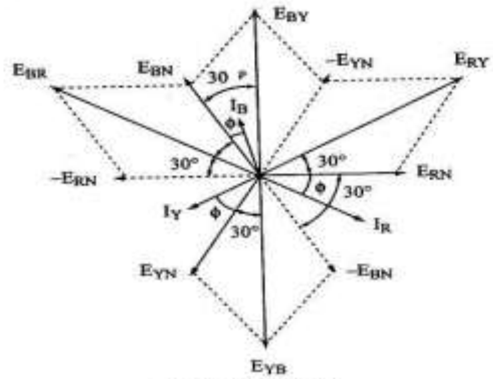
PART – B (12 Mark Questions with Key)

S.No	Questions	Mark	COs	BTL
1	**Determine the line current, power factor, total power, reactive power and apparent power when a 3 phase 400 V supply is given to a balanced star connected load of impedance (15+j20) ohm in each branch.**	12	2	K3
	$Z + I_{ph} + I_L + pf$ $P + Q + S$ ✓ $Z_{ph} = \sqrt{(R^2+X_L^2)} = 25$ ohms ✓ $V_L = 400V$ $V_{ph} = V_L/\sqrt{3} = 230.95$ V ✓ $I_{ph} = I_L = V_{ph} / Z_{ph} = 9.24A$ ✓ $Pf = R/Z = 0.6$ (lag) ✓ $P = \sqrt{3}\, V_L\, I_L \cos \theta = 3840.88$ watts ✓ $Q = \sqrt{3}\, V_L\, I_L \sin \theta = 5121.18$ VAR ✓ $S = \sqrt{3}\, V_L\, I_L = 6401.47$ VA	2+1+1+2 2+2+2		
2	Two watt meters are used to measure power in a three phase system and their readings are 600 W and 300 watts. Find the total three phase power, power factor and reactive power.	12	2	K3
	Power + Power Factor + reactive power ✓ Three phase power = W1+W2 = 600+300 = 900W ✓ Power factor = cosφ = $\cos[\tan^{-1}(\sqrt{3}\frac{W1-W2}{W1+W2})] = 0.866$ ✓ Reactive power = $\sqrt{3}$ * (W1-W2) = 519.6 VAR	4+4+4		
3	**Explain the single line diagram of a typical AC transmission and distribution system. (DEC. 2017)**	12	3	K2
	Single line diagram + Components – explanation	4+8		



4	**i) Derive the relationship between line and phase voltages in a star connected system.** **ii) A balanced star connected load of 3+j4 ohms in each phase is connected to a 3 phase 400V supply. Find phase and line currents. Also find total power consumed by the load.**	7 5	2	K3
	i) Circuit + phasor diagram + Derivation ii) $Z + I_{ph} + I_L + pf + P$ $Z_{ph} = \sqrt{(R^2+X_L^2)} = 5$ ohms $V_L = 400V$ $V_{ph} = V_L/\sqrt{3} = 230.95$ V $I_{ph} = I_L = V_{ph} / Z_{ph} = 46.19$ A Pf = R/Z = 0.6 (lag) $P = \sqrt{3}\ V_L\ I_L \cos \theta = 19200$ watts	2+2+3 5*1=5		
5	**i) Derive the relationship between line and phase voltages in a delta connected system.** **ii) A balanced delta connected load of 8-j6 ohms in each phase is connected to a 3 phase 230V supply. Find phase and line currents. Also find total power consumed by the load.**	7 5	2	K3
	i) Circuit + phasor diagram + Derivation ii) $Z + I_{ph} + I_L + pf + P$ $Z_{ph} = \sqrt{(R^2+X_c^2)} = 10$ ohms $V_L = 230V = V_{ph}$ $I_{ph} = V_{ph} / Z_{ph} = 23$ A $I_L = \sqrt{3}\ I_{ph} = 39.84$ A Pf = R/Z = 0.8 (lead) $P = \sqrt{3}\ V_L\ I_L \cos \theta = 12696.53$ watts	2+2+3 5*1=5		
6	**Determine the line current, power factor, total power, reactive power and apparent power when a 3 phase 400 V 50 Hz supply is given to a balanced delta connected load consisting of 16 ohms resistor in series with 38.2 mH inductor in each branch.**	12	2	K3
	$Z + I_{ph} + I_L + pf$ $P + Q + S$ ✓ $X_L = 2\pi f L = 12$ ohms ✓ $Z_{ph} = \sqrt{(R^2+X_c^2)} = 20$ ohms ✓ $V_L = 400\ V = V_{ph}$ ✓ $I_{ph} = V_{ph} / Z_{ph} = 20$ A ✓ $I_L = \sqrt{3}\ I_{ph} = 34.64$ A ✓ Pf = R/Z = 0.8 (lag) ✓ $P = \sqrt{3}\ V_L\ I_L \cos \theta = 19200$ watts ✓ $Q = \sqrt{3}\ V_L\ I_L \sin \theta = 14400$ VAR ✓ $S = \sqrt{3}\ V_L\ I_L = 24000$ VA	2+1+1+2 2+2+2		

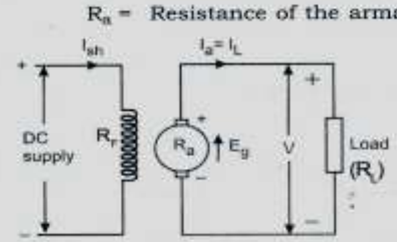
PART – C (20 Mark Questions with Key)				
S.No	**Questions**	**Mark**	**COs**	**BTL**
1	**Show that three phase power can be measured using two single phase watt meters. Also derive expression for power factor in terms of wattmeter readings. (DEC. 2017)**	20	1	K4
	Circuit + Phasor diagram + Derivation for power + power factor	4+6+5+5		

	  Fig. 6.25. Phasor diagram Three phase power= W1+W2= $\sqrt{3}\, V_L I_L \cos\varphi$ Power factor = cosϕ = $\cos[\tan^{-1}(\sqrt{3}\frac{W1-W2}{W1+W2})]$			
2	**A balanced three phase load has an impedance of 7+j7 ohms in each phase. The load is fed with 3 phase 415V supply. The phase sequence is RYB. Determine the line current, phase current, power factor, power, reactive volt-ampere and volt-ampere if the load is (i) star connected (ii) delta connected.**	20	2	K3
	Star: I_L + pf + P + Q + S	5*2		
	Delta: I_L + pf + P + Q + S	5*2		
	Star connection ✓ $Z_{ph} = \sqrt{(R^2+X_L^2)}$= 9.9 ohms ✓ V_L = 415V $V_{ph} = V_L/\sqrt{3}$ = 239.6 V ✓ $I_{ph} = I_L = V_{ph} / Z_{ph}$ = 24.2 A ✓ Pf = R/Z = 0.707 (lag) ✓ P = $\sqrt{3}\, V_L\, I_L \cos\theta$ = 12298 watts ✓ Q = $\sqrt{3}\, V_L\, I_L \sin\theta$ = 12298 VAR ✓ S = $\sqrt{3}\, V_L\, I_L$ = 17394.5 VA Delta connection ✓ $Z_{ph} = \sqrt{(R^2+X_L^2)}$= 9.9 ohms ✓ V_L = 415 V = V_{ph} ✓ $I_{ph} = V_{ph} / Z_{ph}$ = 41.92 A ✓ $I_L = \sqrt{3}\, I_{ph}$ = 72.6 A ✓ Pf = R/Z = 0.707 (lag) ✓ P = $\sqrt{3}\, V_L\, I_L \cos\theta$ = 36893.7 watts ✓ Q = $\sqrt{3}\, V_L\, I_L \sin\theta$ = 36893.7 VAR ✓ S = $\sqrt{3}\, V_L\, I_L$ = 52183.43 VA			

UNIT III – ELECTRICAL MACHINES AND POWER PLANTS

PART – A (2 Mark Questions With Key)

S.No	Questions	Mark	COs	BTL
1	**Define back emf. Also give the importance of back emf in DC motor. (DEC. 2017)**		3	K1
	When a motor rotates, emf is induced in the armature conductors and this induced emf	2		

	opposes the supply voltage. This induced emf is called back emf (or) counter emf. $E_b = P \text{Ø} N Z / 60 A$ Volts. The presence of **back emf** makes the d.c. motor a *self-regulating machine* i.e., it makes the motor to draw as much armature current as is just sufficient to develop the torque required by the load.			
2	**Why single phase induction motor is not a self-starting motor?**			
	When a single phase supply is fed to the stator winding, it produces only an alternating flux i.e., one which alternates along one space axis only. Due to this, starting torque will be zero. Hence the motor does not rotate.	2	3	K2
3	**Write the voltage equation of motor.**			
	$V = E_b + I_a R_a$ where V-Applied voltage, E_b – Back EMF, I_a -Armature current & R_a -Armature resistance	2	3	K1
4	**State Faraday's laws of electromagnetic induction.**			
	First law: Whenever a current carrying conductor cuts the magnetic lines of force an EMF is induced in it. Second law: The induced EMF is directly proportional to the rate of change of flux.	1 1	3	K1
5	**What is the use of commutator?**			
	A device is used in a dc generator to convert the alternating emf into unidirectional emf is called commutator.	2	3	K1
6	**Classify DC generators.**			
	1.Self excited generator i) Series Generator ii) Shunt Generator iii) Compound Generator - Long shunt & Short shunt - Cumulative & differential compound Generators 2. Separately excited generator	1 1	3	K1
7	**Whether Transformer work with DC supply? Justify the answer.**			
	Transformer won't work with DC supply. It works on the principle of mutual induction. Hence it requires change of flux. But DC supply won't produces change in flux w.r.t time.	2	3	K1
8	**Write the emf equation of a transformer.**			
	$E_1 = 4.44 \text{Ø} f N_1$ volts $E_2 = 4.44 \text{Ø} f N_2$ volts E_1- Induced emf in primary E_2- Induced emf in secondary f – supply frequency ø- Maximum flux in core N_1- no. of turns in primary N_2- no. of turns in secondary	1 1	3	K1
9	**Sketch the circuit diagram for separately excited DC generator.**			
	Armature current I_a = Load current I_L R_a = Resistance of the armature winding  *Figure 4.10* Terminal voltage $V = E_g - I_a R_a - V_{brush}$ V_{brush} = voltage drop at the contacts of the brush. Generally V_{brush} is neglected because of very low value. Generated emf $E_g = V + I_a R_a + V_{brush}$. Electric power developed = $E_g I_a$ Power delivered to load = $V I_a$	2	3	K1
10	**Define voltage transformation ratio of transformers. Also write the condition for**			

	step-up transformer.			
	$E_2/E_1 = I_1/I_2 = N_2/N_1 = K$ K - Transformation ratio, E_1, E_2 – EMF induced in Primary & Secondary windings I_1, I_2 – Current in Primary & Secondary windings N_1, N_2 – no. of turns in Primary & Secondary windings In step up transformer, no. of turns in primary winding is less than the no. of turns in secondary winding. Or $E_2 > E_1$	1 1	3	K1
11	**What are the various losses that must be present in a transformer? Write the condition for maximum efficiency of a transformer.**			
	Iron loss and copper loss Condition for maximum efficiency : Iron loss = copper loss	1 1	3	K1
12	**State Fleming's Right hand rule.**			
	If three fingers of right hand, namely thumb, index finger and middle finger are outstretched so that everyone of them is at right angles with the remaining two, and the index finger is made to point in the direction of lines of flux, thumb in the direction of the relative motion of the conductor and the middle finger gives the direction of the induced emf in the conductor.	2	3	K1
13	**List out the various conventional and non-conventional power plants.**			
	Types of conventional power plant: 1. Hydro power plant 2. Steam power plant 3. Nuclear power plant 4. Gas turbine power plant Types of non-conventional power plant: 1. Solar power plant 2. Wind power plant 3. Geothermal power plant 4. Tidal power plant 5. Wave power plant 6.OTEC power plant	1 1	3	K1
14	**What is a surge tank?**			
	A surge tank is a small reservoir in which the water level rises or falls to reduce the pressure swings during opening and closing of inlet valve. The surge tank is not required for run off plants and medium head plants.	2	3	K1
15	**List the factors to be considered while choosing a site for steam power station.**			
	1.Supply of fuel 2. Distance from populated area 3.Transportation facilities 4.Cost and type of land 5.Nearness to load centers 6. Availability of water	2	3	K1

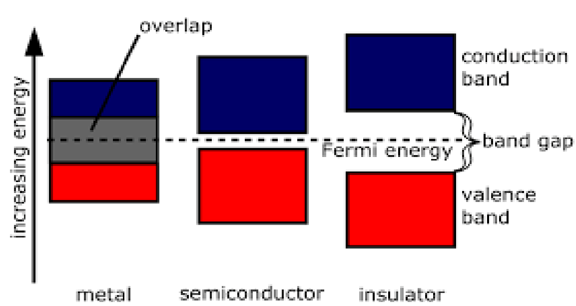
PART – B (12 Mark Questions with Key)

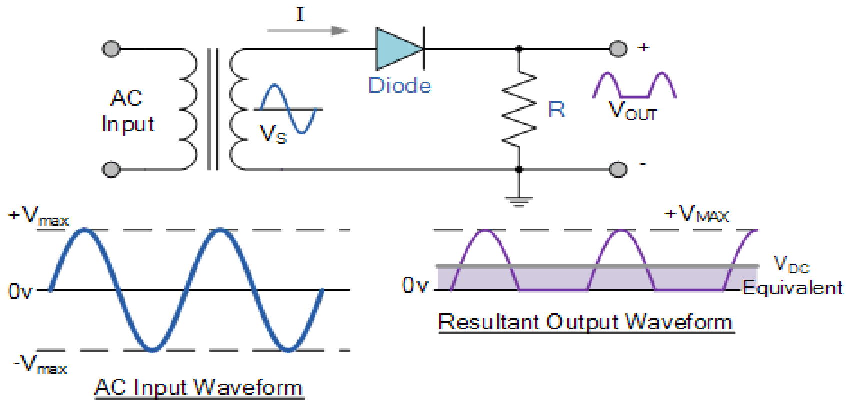
S.No	Questions	Mark	COs	BTL
1	**Explain the working principle of DC generator with necessary diagrams. Also derive an expression for the EMF generated.**	12	3	K2
	Working principle	6		
	EMF equation	6		
2	**Explain the operation of single phase transformer with EMF equation.**	12	3	K2
	Working	6		
	EMF equation	6		
3	**Draw the layout of nuclear power plant and explain the function of each block in detail. (DEC. 2017)**	12	3	K2
	Layout Details of block	4 8		
4	**Explain the working of any one type of single phase induction motor with a neat diagram and speed – torque characteristics. (DEC. 2017)**	12	3	K2
	Circuit Operation	4 4		

	speed – torque characteristics	4		
5	**Draw the layout of thermal power plant and explain the function of each block in detail. (DEC. 2017)**	12	3	K2
	Layout Details of block	4 8		
6	**Draw the layout of hydroelectric power plant and explain the function of each block in detail.**	12	3	K2
	Layout Details of block	4 8		

PART – C (20 Mark Questions with Key)

S.No	Questions	Mark	COs	BTL
1	**(i) A 25 KVA transformer has 500 turns on the primary and 50 turns on the secondary winding. The primary is connected to 3000 V, 50 Hz supply. Find the full load primary and secondary current, the secondary emf and maximum flux in the core. Neglect leakage drops and no load primary current. (DEC. 2017)** **(ii) The number of primary and secondary turns of an ideal transformer is 150 and 300 respectively. The transformer is connected to a 220V, 50 Hz source. Determine i) turns ratio ii) mutual flux in core (DEC. 2017)**	12 8	3	K3
	(i) Primary current, secondary current, secondary emf, maximum flux KVA = 25 N_1 = 500 turns N_2 = 50 turns E_1 = 3000 V f = 50 Hz E_1= 4.44 f Ø N_1 Ø = 27.03 mwb E_2= 4.44 f Ø N_2 = 300 V I_1 = KVA *1000 / E_1 = 8.33 A I_2 = KVA *1000 / E_2 = 83.33 A	(4*3) = 12		
	(ii) Turns ratio and mutual flux a. N_1 = 150 turns N_2 = 300 turns E_1 = 220 V f = 50 Hz b. K = N_2 / N_1 = 2 E_1= 4.44 f Ø N_1 Ø = 6.61 mwb	(4*2) = 8		
2	**(i) A 4 pole wave wound generator has 40 slots and 10 conductors placed per slot. The flux per pole is 0.02 webers. Calculate the generated emf when the generator is driven at 1200 rpm.** **(ii) A DC motor connected to 460V supply has an armature resistance of 0.15 ohms. Calculate (i) the value of back emf when armature current is 120A and (ii) the value of armature current when the back emf is 471V.**	10 10	3	K3
	(i) E_g P= 4 No of conductors = no of slots X no of conductors per slot = 400 = Z Ø = 0.02 wb N 1200 rpm E_g = P Ø N Z / 60 A = 160 V	10		
	(ii) E_b & I_a V-Applied voltage = 460 V Eb – Back EMF Ra-Armature resistance = 0.15 ohms (i) Eb = ? Ia Armature current = 120A V = Eb + Ia Ra Eb = V - Ia Ra = 442 V (ii) Ia = ? Eb = 471 V Ia = (V-Eb) / Ra = -73.33A	5+5 = 10		

UNIT IV – SEMICONDUCTOR DEVICES AND TRANSDUCERS				
PART – A (2 Mark Questions With Key)				
S.No	**Questions**	**Mark**	**COs**	**BTL**
1	**Define a semiconductor.**		5	K2
	A semiconductor material is an element with 4 valance electrons and whose electrical properties lie in between that of insulators and conductors.	2		
2	**What is Fermi level?**	2	5	K2
	At room temperature the maximum energy level occupied by an electron is at the middle of the forbidden energy gap, it is known as “Fermi Level”.			
3	**What is P-type semiconductor? Give example.**	2	5	K2
	When a small amount of trivalent impurity is added to pure semiconductor, ‘P’ type semiconductor is formed. Examples for the trivalent impurity are boron, gallium, Indium etc.			
4	**What is meant by energy band?**	2	5	K2
	In case of a solid, instead of single energy levels associated with the single atom, there will be bands of energy levels. A set of such closely packed energy levels are called an energy band.			
5	**Draw the energy band diagrams for conducror, semiconductor and insulators.**	2	5	K2
				
6	**Define PIV of a diode. (DEC. 2017)**	2	5	K2
	For rectifier applications, *peak inverse voltage* (*PIV*) or peak reverse voltage (PRV) is the maximum value of reverse voltage which occurs at the peak of the input cycle when the *diode* is reverse-biased			
7	**Draw a half wave rectifier circuit.**	2	5	K2



8	**What is an amplifier?**	2	5	K2
	An amplifier is a circuit used to increase the magnitude of the input current or voltage at the output by means of energy drawn from an external source.			
9	**Define Oscillator.**	2	5	K2
	An oscillator is a circuit which produces a continuous, repeated, alternating waveform without any input. Oscillators basically convert unidirectional current flow into oscillations.			
10	**What are the types of oscillator?**	2	5	K2
	Sinusoidal and non-sinusoidal oscillators RC oscillators: Wien Bridge & Phase-Shift oscillators LC oscillators: Hartley & Colpitts oscillators Unijunction / relaxation oscillators			
11	**What are the applications of LVDT?**	2	5	K2
	1. LVDT is used to measure displacement ranging from millimeter to centimeter. 2. Acting as a secondary transducer. 3. LVDT can be used as a device to measure force, weight and pressure.			
12	**What is Resistance temperature detector?**	2	5	K2
	Resistance Temperature Detectors - are temperature sensors that contain a resistor that changes resistance value as its temperature changes. ... Most RTD elements consist of a length of fine coiled wire wrapped around a ceramic or glass core.			
13	**Define transistor biasing?**	2	5	K2
	The proper flow of zero signal dc collector current and the maintenance of proper collector emitter voltage during the passage of signal is known as transistor biasing.			
14	**List the applications of BJT.**	2	5	K2
	1. Act as a switch 2. Amplifier			
15	**What are the disadvantages of half wave rectifier?**	2	5	K2
	1. Low rectification efficiency 2. Low TUF 3. High ripple factor			

PART – B (12 Mark Questions with Key)

S.No	Questions	Mark	COs	BTL
1	**Explain the construction, operation and V-I characteristics of PN junction diode.**	12	5	K2
	PN junction diode construction	4		
	operation	4		
	V-I characteristics	4		

2	**Explain the construction, operation and V-I characteristics of zener diode. (DEC. 2017)**	12	5	K2
	Zener diode construction	4		
	operation	4		
	V-I characteristics	4		
3	**Explain the operation of full wave bridge rectifier with neat circuit diagram and waveforms. Also list the advantages. (DEC. 2017)**	12	5	K2
	Full wave bridge rectifier circuit diagram	3		
	operation	3		
	waveforms	3		
	advantages	3		
4	**Explain the operation of half wave rectifier with neat circuit diagram and waveforms. Also list the features. (DEC. 2017)**	12	5	K2
	Half wave rectifier circuit diagram	3		
	HWR operation	3		
	waveforms	3		
	Features of HWR	3		
5	**Describe in detail about the working principle and operation of linear variable differential transformer (LVDT).**	12	5	K2
	LVDT construction diagram, working principle	4		
	Characteristics/graph	2		
	Advantages, disadvantages	4		
	Applications	2		
6	**Describe in detail about the working principle and operation of resistance temperature detector (RTD).**	12	5	K2
	RTD construction diagram, working principle	4		
	Characteristics/graph	2		
	Advantages, disadvantages	4		
	Applications	2		
7	**Explain the input and output characteristics of common base (CB) configuration.**	12		
	Circuit Operation Input characteristics Output characteristics	3 3 3 3	5	K2
8	**Explain the input and output characteristics of common emitter (CE) configuration.**	12		
	Circuit Operation Input characteristics Output characteristics	3 3 3 3	5	K2
9	**Explain the input and output characteristics of common collector (CC) configuration. (DEC. 2017)**	12		
	Circuit Operation Input characteristics Output characteristics	3 3 3 3	5	K2
10	**Compare the three different transistor configurations in detail.**	12	5	K2
	Any 6 points	6x2		

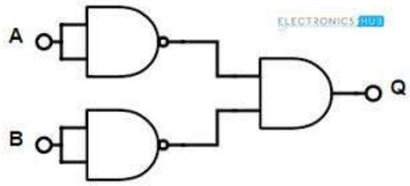
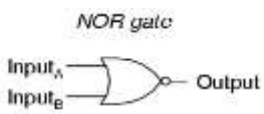
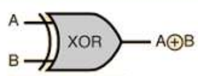
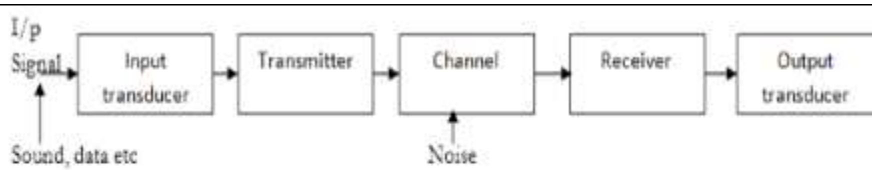
PART – C (20 Mark Questions with Key)				
S.No	**Questions**	**Mark**	**COs**	**BTL**

1	**(i) Classify amplifiers and give their applications** **(ii) Classify oscillators and give their applications**	10 10	5	K3
	Amplifier-classification, applications	5+5		
	Oscillator- classification, applications	5+5		
2	**Distinguish between amplifiers and oscillators. Explain any one amplifier and also an oscillator in detail.**	20	5	K3
	Comparison between amplifiers and oscillators	6		
	Amplifier-circuit diagram, working, applications	7		
	Oscillator-circuit diagram, working, applications	7		

UNITV– DIGITAL ELECTRONICS AND COMMUNICATION SYSTEMS

PART – A (2 Mark Questions With Key)

S.No	Questions	Mark	COs	BTL
1	**State Demorgan's theorem. (DEC. 2017)**	2	4	K3
	Demorgan's first law: This law states that the complement of the sum of the variables equals the product of a complement of each variable. Equation -1 Demorgan's second law: This law states that the complement of the product (of the variables) equals the sum of a complements of each variable. Equation -2 $\overline{A+B}=\overline{A}\cdot\overline{B}$ $\overline{A\cdot B}=\overline{A}+\overline{B}$			
2	**State the laws of Boolean Algebra.**	2	4	K3
	1) $X\cdot 0=0$ 2) $X\cdot 1=X$ 3) $X\cdot X=X$ 4) $X\cdot\overline{X}=0$ 5) $X+0=X$ 6) $X+1=1$ 7) $X+X=X$ 8) $X+\overline{X}=1$ 9) $\overline{\overline{X}}=X$ 10A) $X\cdot Y=Y\cdot X$, 10B) $X+Y=Y+X$ — Commutative Law 11A) $X(YZ)=(XY)Z$, 11B) $X+(Y+Z)=(X+Y)+Z$ — Associative Law 12A) $X(Y+Z)=XY+XZ$, 12B) $(X+Y)(W+Z)=XW+XZ+YW+YZ$ — Distributive Law 13A) $X+\overline{X}Y=X+Y$, 13B) $\overline{X}+XY=\overline{X}+Y$, 13C) $X+\overline{X}\,\overline{Y}=X+\overline{Y}$, 13D) $\overline{X}+X\overline{Y}=\overline{X}+\overline{Y}$ — Consensus Theorem 14A) $\overline{XY}=\overline{X}+\overline{Y}$, 14B) $\overline{X+Y}=\overline{X}\,\overline{Y}$ — DeMorgan's 6			
3	**What are universal gates? Why are they called so?**			
	The NAND and NOR gates are universal gates. A universal logic gate is a logic gate that can be used to construct all other logic gates.			

4	 **Write the expression for the output Q.**	2	4	K2
	$Q = \bar{A} \cdot \bar{B}$			
5	**Give logic diagram and truth table of NOR gate.**	2	4	K2
	 <table><tr><th>A</th><th>B</th><th>Output</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>			
6	**Draw the logic symbol and truth table of EX-OR gate.**	2	4	K2
	 <table><tr><th>A</th><th>B</th><th>Out</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>			
7	**Draw the block diagram of a communication system.**	2	6	K2
	 Fig: Basic analog communication system			
8	**Give the difference between wired and wireless network. (DEC. 2017)**	2	6	K2
	"Wired" is the term refers to any physical medium consisting of cables. The cables can be copper wire, twisted pair or fiber optic. "Wireless" is the term refers to medium made of electromagnetic waves (i.e. EM Waves) or infrared waves. All the wireless devices will have antenna or sensors. Typical wireless devices include cellular mobile, wireless sensors, TV remote, satellite disc receiver, laptops with WLAN card etc.			
9	**Define analog signal.**	2	6	K2
	The amplitude of the signal is varies continuously with time. This signal is called analog signal. Example, voltage or current varies continuously with time.			
10	**What is meant by modulation?**	2	6	K2
	Modulation is the process of varying one or more properties of a periodic waveform, called the			

	carrier signal, with a **modulating** signal that typically contains information to be transmitted.			
11	**Define pulse width modulation.**	2	6	K2
	In pulse width modulation, the width of the carrier pulse is varied accordance to message signal amplitude.			
12	**Give the applications of fibre optic communication system.**	2	6	K2
	Applications 1. Long distance telephone system. 2. Interconnect computers in networks within a large building. 3. Carry control signals in airplanes and ships. 4. Secure communications systems at military bases. 5. Shipboard and Aircraft communications. 6. Plant and traffic control. 7. Data acquisition and control signal communications in industrial process control systems. 8. Nuclear plant instrumentation.			
13	**List advantages and disadvantages of Fibre-optic communication.**	2	6	K2
	Advantages and Disadvantages of Fiber Optics ▸ Advantages: ▸ Huge bandwidth: ▸ Ethernet cable: 1Gbps ▸ Fiber optics: 250Gbps ▸ Immunity to electrical noise ▸ No crosstalk ▸ Reduced size and weight cables ▸ Resistance to corrosion and temperature variations. ▸ Disadvantages: ▸ Expensive in comparison with conventional electrical cables. ▸ Expensive and difficult installation.			
14	**What is microwave? (DEC. 2017) Give the advantages of Microwave communication.**	2	6	K2
	Microwave is an electromagnetic wave with a wavelength in the range 0.001–0.3 m, shorter than that of a normal radio wave but longer than those of infrared radiation. Microwaves are used in radar, in communications, and for heating in microwave ovens and in various industrial processes. 1. Reliability and high quality. 2. Noise immunity for data, voice or video signals. 3. Capable of using frequency bands above 10GHz. 4. High RF spectrum efficiency. 5. Ability to accommodate increased telephone traffic, economically and conveniently.			
15	**Compare AM and FM**	2	6	K2
	Amplitude Modulation **Frequency Modulation**			

	1.The amplitude of AM signal is Varies depending on modulating signal. 2. Transmitters are simple and cheap. 3. Bandwidth (BW) is very small. 4. Area of reception is large. 5. Noise cannot be easily minimized.	1. The amplitude of FM signal is Constant and independent of depth of modulation. 2. Transmitters are complex and Expensive. 3. BW is very high. 4. Area of reception is small. 5. Noise can be easily minimized.			

PART – B (12 Mark Questions with Key)

S.No	Questions	Mark	COs	BTL
1	**Why NAND and NOR gates are known as Universal gates? Explain in detail.**	12	4	K3
	Reason for Universal gates	2		
	Realization of OR, AND & NOT gates using NAND gate	5		
	Realization of OR, AND & NOT gates using NOR gate	5		
2	**Explain the operation of microwave communication in detail.**	12	6	K2
	Microwave communication-block diagram	6		
	Explanation, merits, demerits	6		
3	**Describe about the operation of satellite communication using block diagram.**	12	6	K2
	Satellite communication-block diagram	6		
	Explanation, merits, demerits	6		
4	**Describe about fiber optic communication in detail. (DEC. 2017)**	12	6	K2
	Fiber optic communication-block diagram	6		
	Explanation, merits, demerits	6		
5	**Enumerate about cellular mobile communication in detail. (DEC. 2017)**	12	6	K2
	Cellular mobile communication-block diagram	6		
	Explanation, merits, demerits	6		
6	**Write short notes on (i) Amplitude modulation and (ii) frequency modulation**	12	6	K2
	Amplitude modulation -block diagram, working, explanation	6		
	frequency modulation- block diagram, working, explanation	6		
7	**Write short notes on (i) PAM (ii) PWM and (iii) PPM**	12	6	K2
	PAM-block diagram, working, explanation	4		
	PWM-block diagram, working, explanation	4		
	PPM-block diagram, working, explanation	4		

PART – C (20 Mark Questions with Key)

S.No	Questions	Mark	COs	BTL
1	**Explain the operation of the following logic gates with necessary truth table** **(i) AND (ii) OR (iii) NOT (iv) NAND (v) NOR (vi) EX-OR (vii) EX-NOR**	20	4	K2
	(i) AND (ii) OR (iii) NOT logic gates- symbol, truth table, explanation	3×2=6		
	(iv) NAND (v) NOR- symbol, truth table, explanation	2×3=6		
	(vi) EX-OR (vii) EX-NOR- symbol, truth table, explanation	2×4=8		
2	**(i) Reduce the following Boolean expressions and implement using logic gates** **(a) AB+A(B+C)+B(B+C)** **(b)** $\bar{A}BC + A\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C} + A\bar{B}C + ABC$ **(ii) Reduce the following expressions using De-Morgan's theorem and implement using logic gates** **(a)**	10 10	4	K3

	(b) $F_1 = \overline{(\overline{X \cdot \overline{Y}}) \cdot (\overline{Y} + Z)}$ $F_2 = \overline{(\overline{X} + Z)(\overline{XY})}$			
	(i)Reduction of Boolean expressions, implementation	2×5=10		
	(ii)Reduction of expressions using De-Morgan’s theorem, implementation	2×5=10		