INSTITUTE OF AERONAUTICAL ENGINEERING

Dundigal, Hyderabad -500 043

AERONAUTICAL ENGINEERING

TUTORIAL QUESTION BANK

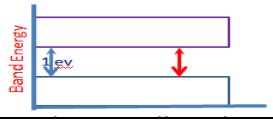
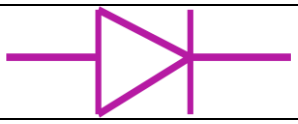
Course Name	:	**ELECTRICAL AND ELECTRONICS ENGINEERING**
Course Code	:	A40203
Class	:	II B. Tech II Semester
Branch	:	Aeronautical Engineering
Year	:	2014 – 2015
Course Faculty	:	Mr A. Sathish Kumar, Assistant Professor and Mr A. Naresh Kumar, Assistant Professor

OBJECTIVES

Electrical And Electronics Engineering course is belongs to basic knowledge of high voltage and low voltage Circuits. This course introduces the basic concepts of circuit analysis which is the Foundation for all subjects of the Electrical Engineering discipline. The course deals with the basic analysis of single phase circuits, DC machines, AC machines and principles of indicating instruments. It also emphasis on basics of electronics, semiconductors devices and their characteristics and operational features

GROUP-I (SHORT ANSWER TYPE QUESTIONS)

S. No	Question	Blooms Taxonomy Level	Course Outcome
	UNIT-I (Electrical circuits and Instruments)		
1	State Ohm's law	Evaluate	1
2	State Kirchhoff's voltage law and Kirchhoff's Current law	Analyze	1
3	Give two applications of both series and parallel combination	Remember	2
4	Write short notes on resistor, capacitor, and inductor with relevant expression	Understand	1
5	Given that the resistors Ra, Rb and Rc are connected electrically in star. Write the equations for resistors in equivalent delta	Evaluate	1
6	What are the types of measuring instruments	Evaluate	2
7	Basic definitions of current and voltage, power	Evaluate	1
8	Write short notes on spring control mechanism	Remember	3
9	What is mean by instrument? Different types of instrument	Evaluate	1
10	Write different types of torques.	Evaluate	1
	UNIT – II (DC Machines)		
1	State Fleming's Right Hand Rule.	Remember	1
2	What is the basic principle of a dc generator?	Analyze	5
3	What are the basic parts of a dc generator?	Analyze	5
4	What are the different types of dc generators?	Analyze	5

S. No	Question	Blooms Taxonomy Level	Course Outcome
5	What is back emf in d.c. motor?.	Evaluate	6
6	Draw the circuit diagram of a Dc series motor Write down faraday's law of electromagnetic induction	Understand	6
7	What are the applications of DC motors?	Remember	7
8	State the function of commutator?	Remember	7
9	Draw the open circuit characteristics of dc separately excited generator	Evaluate	5
10	What do you mean by residual EMF in a generator?	Remember	5
	UNIT – III (AC MACHINES)		
1	Mention the difference between core and shell type transformers	understand	8
2	Give the emf equation of a transformer and define each term	Understand	8
3	Define voltage regulation of a transformer.	Evaluate	8
4	Define transformation ratio	Analyze	8
5	State two types of induction motors	Evaluate	9
6	Derive maximum torque condition under running condition.	Evaluate	9
7	Draw torque slip characteristics of three phase induction motor.	Evaluate	9
8	Name the types of Alternator based on their rotor construction.	Evaluate	10
9	Define the term voltage regulation of Alternator	Analyze	10
10	How synchronous impedance is calculated from OCC and SCC?	Remember	10
	UNIT-IV DIODES AND TRANSISTORS		
1	Explain avalanche breakdown?	Understand	3,5
2	Differentiate intrinsic and extrinsic semiconductors?	Analyze	1
3	Define static and dynamic resistance?	Remember	4
4	Name the three energy bands in Solids materials 	Remember	1
5	Explain Active region?	Understand	1
6	Express importance of Cut in voltage?	Remember	3
7	Define transformer utility factor?	Remember	1
8	Design a circuit for transistor as a switch?	Synthesize	3
9	Define saturation region?	Remember	4
10	Identify the Anode and cathode in the given Diode and draw a circuit diagram for positive biasing. 	Apply	1
11	Derive relationship among α, β?	Analyze	5
12	Explain majority and minority carriers in a semiconductor?	Understand	1
13	Define efficiency?	Remember	1
14	Define ripple factor?	Remember	1
15	Define peak inverse voltage?	Remember	1
16	Define form factor?	Remember	1
	UNIT-V CATHODE RAY OSCILLOSCOPE		
1	Explain the function of deflection plates?	Understand	7
2	Explain is the function of accelerating anode?	Understand	7
3	Explain the function of vertical plates in CRT?	Understand	7
4	Describe the function of horizontal plates?	Remember	7
5	Define Fluorescence?	Remember	9
6	Explain the Principle of dual beam oscilloscope?	Analyze	5

S. No	Question	Blooms Taxonomy Level	Course Outcome
7	Explain the principle of sampling oscilloscope?	Understand	6
8	Mention the two modes of operation in dual trace oscilloscope	Remember	4
9	List the Disadvantages of storage cathode ray tube	Understand	7
10	Define Electric Field?	Remember	8
11	Define Magnetic Field?	Remember	8
12	Describe CRT?	Understand	7
13	Formulate Force between two charges?	Create	8
14	Applications of Cathode Ray Oscilloscope	Apply	5,6

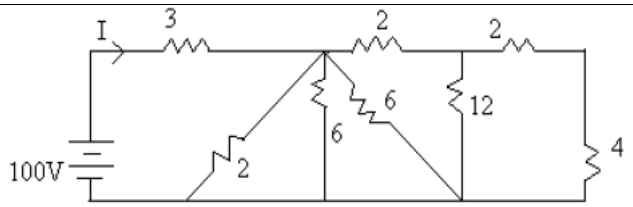
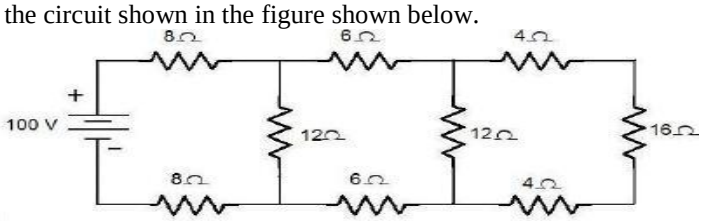
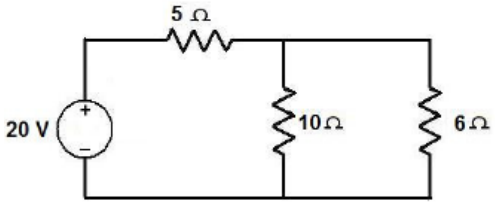
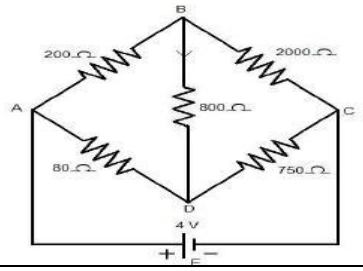
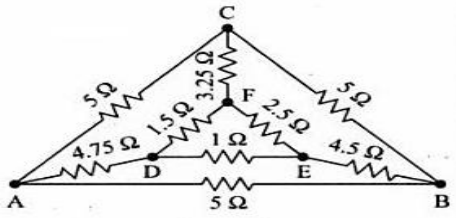
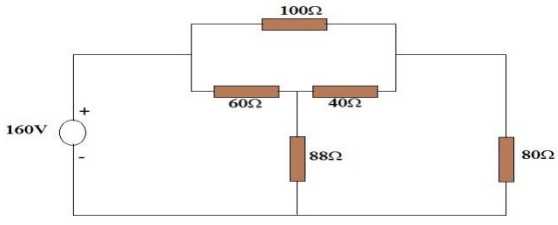
GROUP-II (LONG ANSWER QUESTIONS)

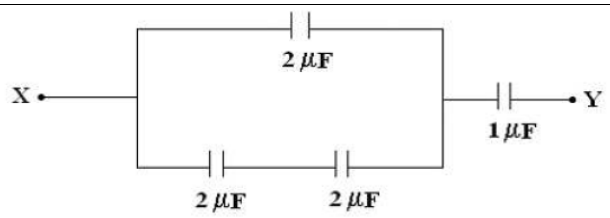
UNIT-I (Electrical circuits and Instruments)			
1	Derive star-delta conversion equations?	Analyze	1
2	Derive delta-star conversion equations?	Analyze	1a
3	Describe different types of elements with examples	Creating	1
4	Describe about series and parallel resistive and inductance, capacitor networks	Apply	1
5	Explain working principle of permanent magnet moving coil instrument	Analyze	1
6	Describe working principle of moving iron attraction type instrument	Apply	1
7	Describe working principle of moving iron repulsion type instrument	Creating	3
8	Discuss working of different types of torques produced in indicating instruments	Analyze	4
UNIT-II (DC MACHINES)			
1	Describe the construction of dc machine with neat diagram?	Apply	5
2	Discuss the principle of operation of DC generator?	Evaluate	7
3	Derive the equation for induced EMF of a DC machine.	Creating	5
4	Explain the principle of operation of DC Motor	Apply	6
5	Give the classification of DC generator and explain with neat diagrams	Analyse	5
6	Derive the torque equation of DC motor.	Apply	6
7	Discuss different types of characteristics of different types of generators	Analyse	5
8	Explain three point starter for D.C. Shunt motor	Analyse	5
9	Differentiate between self-excited and separately excited d.c. machines	Evaluate	6
10	Discuss Different types of characteristics of DC motors	Apply	6
UNIT-III AC MACHINES			
1	Describe the construction details of single phase transformer.	Create	10
2	Explain the principle of operation of transformer.	Evaluate	10
3	Derive the EMF equation of a transformer.	Evaluate	10
4	Discuss about different types of losses in transformer.	Analyze	10
5	Describe the method to perform OC and SC test on a transformer.	Evaluate	10
6	Discuss the principle and operation of three phase induction motor.	Evaluate	10
7	Discuss about Different types of Induction motors depends upon the rotor construction.	Evaluate	10
8	Derive maximum torque condition under running and standstill condition of induction motor.	Remember	8
9	Describe the construction of alternator depends upon rotor construction.	Understand	8
10	Discuss about synchronous impedance method to find regulation of an alternator.	Understand	8

UNIT-IV **DIODES AND TRANSISTORS**			
1	Explain the theory of PN junction in semiconductors and explain how it acts as diode?	Understand	3
2	Explain different biasing conditions of the PN junction crystal diode	Understand	3
3	Discuss V-I characteristics of a silicon PN junction crystal diode and Analyze the significance of the knee voltage?	Analyze	3
4	Analyze the effect of temperature on the volt – ampere characteristics of a diode	Analyze	5
5	Zenor diode works in reverse biased condition. How the Zener diode and it's breakdown mechanism work as regulator?	Evaluate	5
6	Describe the Diode current equation.	Apply	5
7	What is the importance of a filter in voltage rectification process and describe different types of filters.	Understand	4
8	Define rectifier? Describe all parameters for Half wave rectifier?	Remember	1,10
9	Define rectifier? Describe all parameters for Centre tapped full wave rectifier?	Understand	1,10
10	Define rectifier? Describe all parameters for bridge rectifier?	Remember	1,10
11	Discuss the difference between Half waves; centre tapped full wave and bridge rectifiers.	Analyze	1,10
12	Explain the operation of SCR and its characteristics?	Understand	3
13	Explain the term α and β current gains and their relationship for N-P-N transistor?	Understand	5
14	Explain the operation of NPN and PNP transistor?	Understand	5
15	Illustrate with a diagram, how the BJT transistor acts as an amplifier?	Understand	5
UNIT-V **CATHODE RAY OSCILLOSCOPE**			
1	Give the construction of a Cathode Ray tube using electrostatic focusing and deflection systems and describe the functions of various constituents.	Understand	5
2	Give the construction of a Cathode Ray tube using magnetic focusing and deflection systems and describe the functions of various constituents.	Create	9
3	Write the principle of CRT? Explain the different types of CROs?	Understand	5
4	Explain the Block diagram of CRO with neat sketch?	Create	9
5	Describe functional block diagram of CRT?	Understand	5
6	Explain the applications of CRO?	Create	9
7	Explain the electron gun construction and working?	Understand	5
8	How the magnetic deflection system works in CRT?	Apply	9
9	Explain the Electrostatic deflection system in CRT?	Understand	5
10	Differentiate Electrostatic and magnetic deflection systems?	Evaluate	9
11	Describe the voltage, current and frequency measurements using CROs.	Synthesize	9

GROUP-III (ANALYTICAL QUESTIONS)

UNIT-I **(Electrical circuits and Instruments)**			
1	A voltage of 200 V is applied to a tapped resistor of 500Ω. Find the resistance between the tapping points connected to a load, needing 0.1A at 25 V. Also calculate the Total power consumed	Understand	1
2	An inductor having inductance of 2mH is charged to a current of 1A. Calculate the stored energy in joules	Understand	1
3	If 3 capacitors of values 2mF, 4mF, 5mF are connected in parallel. Calculate the effective capacitance.	Understand	1
4	Determine the current I in the circuit shown in figure. All resistances are in ohms.	Understand	1

			
5	Calculate a) the equivalent resistances across the terminals of the supply, b) total current supplied by the source and c) power delivered to 16 ohm resistor in the circuit shown in the figure shown below. 	Remember	1
6	Find the power consumed by each resistor 	Evaluate	2
7	Determine the current through 800 ohm resistor in the network shown in figure 	Apply	2
8	Find the resistance between the A and B by using star delta conversion 	Analyze	1
9	Determine the resistance between the terminals A&B and hence find the current through the voltage source 	Apply	1
10	Find the equivalent capacitance of the combination shown figure below across X and Y.	Apply	4

			
UNIT-II (DC MACHINES)			
1	Calculate the e.m.f by 4 pole wave wound generator having 65 slots with 12 conductors per slot when driven at 1200 rpm the flux per pole is 0.02 wb	Remember	6
2	A 6 pole lap wound dc generator has 600 conductors on its armature flux per pole is 0.02 wb. Calculate i. The speed at which the generator must be run to generate 300v. ii. What would be the speed if the generated were wave wound	Understand	6
3	An 8-pole, lap wound armature rotated at 350 rpm is required to generate 260v. The use ful flux per pole is 0.05 wb if the armature has 120 slots, calculate the number of conductors per slot.	Remember	7
4	A 440v Dc shunt generator has Ra=0.25 ohms and Rsh= 220 ohms while delivering a load current of 50 amps, it has a terminal voltage of 440v determined the generated e.m.f and power developed?	Understand	6
5	A Dc series generator has armature resistance of 0.5 ohms and series field resistance of 0.03 ohms it drives a load of 50 amps. if it has 6 turns/coil and total 540 coils on the armature and is driven at 1500 rpm calculate the terminal voltage at the load. Assume 4-poles, lap type winding, flux pole as 2 mwb and total brush drop as 2v.	Apply	6
6	A 4-pole lap wound dc shunt generator has a useful flux per pole of 0.07 wb. The armature winding consists of 220 turns, each of 004 ohms resistance. Calculate the terminal voltage when running at 900 rpm if the armature current is 50 amps.	Remember	6
7	A shunt generator supplies 96 amps at a terminal voltage of 200 volts the armature and shunt field resistances are 0.1 ohms and 50 ohms respectively. The iron and frictional losses are 2500 watts. Find i) E.m.f generated ii) copper losses iii) commercial efficiency	Apply	7
8	A 250 v shunt motor takes a total current of 20 amps the shunt field and armature resistances are 200 ohms and 0.3 ohms respectively determine i) Value of back E.m.f ii) gross mechanical power in the armature	Remember	7
9	Calculate the value of torque established by the armature of a 4pole motor having 774 conductors, two paths in parallel,24 mwb flux per pole , when the total armature current is 50 amps.	Apply	7
10	A 230v dc shunt motor takes a current of 40 amps and runs at 1100 rpm if armature and shunt field resistances are 0.25 ohms and 230 ohms respectively. Find the torque developed by armature	Apply	7
UNIT-III AC MACHINES			
1	A transformer supplied a load of 32A at 415V. If the primary voltage is 3320V,find the following: (a) Secondary volt ampere (b) Primary current (c) Primary volt ampere. Neglect losses and magnetizing current	Understand	8
2	A 125 KVA transformer having primary voltage of 2000V at 50 Hz has 182 primary and 40 secondary turns. Neglecting losses, calculate i) The full load primary and secondary currents. ii) The no-load secondary induced emf. iii) Maximum flux in the core	Evaluate	8
3	A single phase transformer has 50 primary and 1000 secondary turns. Net cross sectional area of the core is 500 cm2. If the primary winding is connected to 50	Evaluate	8

	Hz supply at 400 V, Calculate the value of Maximum flux density on core and the emf induced in the secondary.		
4	A transformer with 40 turns on the high voltage winding is used to step down the voltage from 240V to 120V. Find the number of turns in the low voltage winding. Open circuit and short circuit tests on a 5 KVA, 220/400V, 50 Hz, single phase transformer gave the following results: OC Test: 220V, 2A, 100W (lv side) SC Test: 40V, 11.4A, 200W (hv side) Obtain the equivalent circuit	Evaluate	8
5	The efficiency of a 400 kva ,single phase transformer is 98.77% when delivering full-load at 0.8 pf lagging and 99.13% at half load at unity power factor calculate i) iron losses and full load copper losses	Analyze	9
6	A 440/110 v transformer has a primary resistance of 0.03 ohms and secondary resistance of 0.02 ohms if iron losses at normal input is 150 watts determine the secondary current at which maximum efficiency will occur and the value of this maximum efficiency at a unity power factor load.	Apply	9
7	A 4 – pole 3 phase star connected alternator armature has 12 slots with 24 conductors per slot and the flux per pole is 0.1 Wb. Calculate line emf generated at 50 Hz. Calculate the distribution factor of a 36 slot, 4 pole single layer winding of an alternator.	Apply	9
8	A part of an alternator winding consists of six coils in series, each coil having an emf of 10V rms Induced in it. The coils are placed in successive slots and between each slot and the next; there is an Electrical phase displacement of 30 degrees. Calculate the emf of the six coils in series	Understand	9
9	In case of an 8-pole induction motor the supply frequency was 50 Hz and the shaft speed was 735 rpm. Compute i) Synchronous speed ii) Slip speed per unit slip iii)Percentage slip	Apply	9
10	A 6-pole, 50Hz squirrel cage induction motor runs on load at a shaft speed of 970 rpm. Calculate i) Percentage slip ii) The frequency of the induced current in the rotor	Apply	9
	UNIT-IV **DIODES AND TRANSISTORS**		
1	A diode operating at 300^0K at a forward voltage of 0.4v carries a current of 10mA.when voltage is changed to 0.42V the current becomes twice. Calculate the value of reverse saturation current and efficiency for the diode	Apply	7
2	A PN junction diode as are verse saturation current of 30μA at a temperature of 125^oC. at same temperature, find the dynamic resistance for 0.2V bias in forward and reverse direction.	Apply	7
3	Determine the values of forward current in the case of PN junction diode, with $I_{0=}$ 10μA V_f = 0.8V at T=300 ^{0}K Assume Si diode.	Apply	7
4	In a full wave rectifier using an LC filter L = 10H , C = 100μf and R_l= 500Ω calculate $I_{dc,}$ V_{dc} , ripple factor for an input of Vi= 30sin(100πt)V	Understand	6& 7
5	A 230V ,60Hz voltage is applied to the primary of a 5 :1 step down ,center tapped transformer used in a full wave rectifier having a load of 900Ω.with diode resistance and secondary coil resistance together has a resistance of 100Ω determine i. DC voltage across the load ii. DC current flowing through the load iii. DC power delivered to the load iv. PIV across each diode v. Ripple voltage and its frequency	Apply	7
6	A full wave rectifier supplies a load requiring a 300V at 200mA. Calculate the transformer secondary voltage for	Understand	6 & 8

	i. A capacitor input filter using a capacitor of 10μf ii. A choke input filter using a choke of 10H and capacitance of 10μf neglect the resistance of choke.		
7	Calculate the values of I_c and I_e for a transistor with α_{dc} = 0.99 and I_{cbo} = 5μA , I_b is measured as 20μA.	Understand	6 & 8
8	The reverse saturation current in a transistor is 8μA if the transistor common base current gain is 0.979; calculate collector and emitter current for 40 μA base current.	Understand	6 & 8
9	A transistor operating in CB configuration has I_c =2.98mA I_e = 3mA I_{c0} =0.01mA, what current will flow in the collector circuit of this transistor when connected in CE configuration with a base current of 30 μA.	Evaluate	8
10	Given an npn transistor for which α = 0.98 Ic0 = 2 μA. And I_{ce0} = 1.6μA. a common emitter connection is used and V_{cc} = 12V and R_l= 4KΩ what is the minimum base current required in order that transistor enter into saturation region.	Understand	6 & 8
11	The brightness of a 100 W, 110 V lamps is to be varied by controlling firing angle of SCR full wave circuit. The RMS value of A.C. voltage appearing across each SCR is 110 V. Find the RMS voltage and current in the lamp at firing angle of 600.	Analyze	9 & 8
	UNIT-V **CATHODE RAY OSCILLOSCOPE**		
1	An electron moving with initial velocity of 10 6 m/s enters an uniform magnetic field at an angle of 30 0 with it. Calculate the magnetic flux density required in order that the radius of helical path be 1m. Also, calculate the time taken by the electron for one revolution and the pitch of the helix	Analyze	9& 8
2	An electrostatic cathode ray tube has a final anode voltage of 400 V. The deflection plates are 2 cm long and 1 cm apart. The screen is at a distance of 10 cm from the centre of the plates. A voltage of 20 V is applied to the deflection plates. Calculate i) Velocity of electron on reaching the field, ii) Acceleration due to deflection field, iii) Deflection produced on the screen and iv) Deflection sensitivity.	Evaluate	9
3	In a CRT, the distance of the screen from the centre of the magnetic field is 22 cm, the deflecting magnetic field of flux density 2 × 104 Wb/m2 extends for a length of 2.5 cm along the tube axis. The final anode voltage is 1250 V. Calculate the deflection of the spot in cm.	Evaluate	8& 9

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