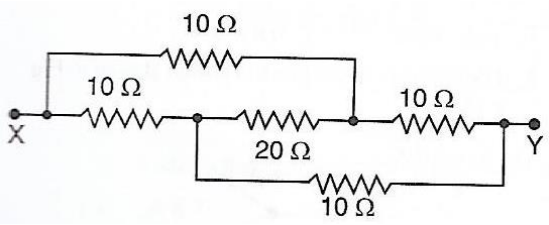
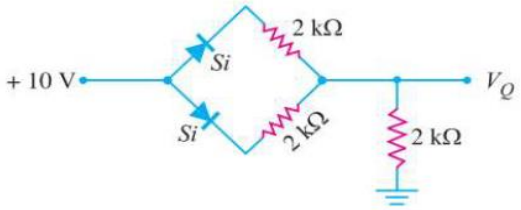
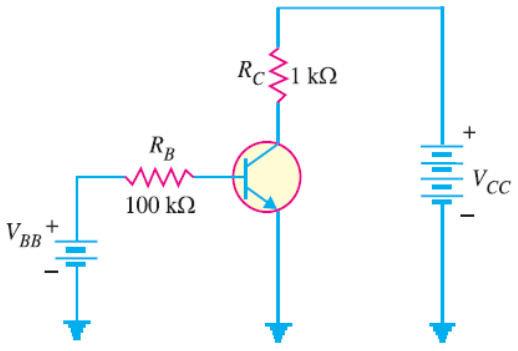
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

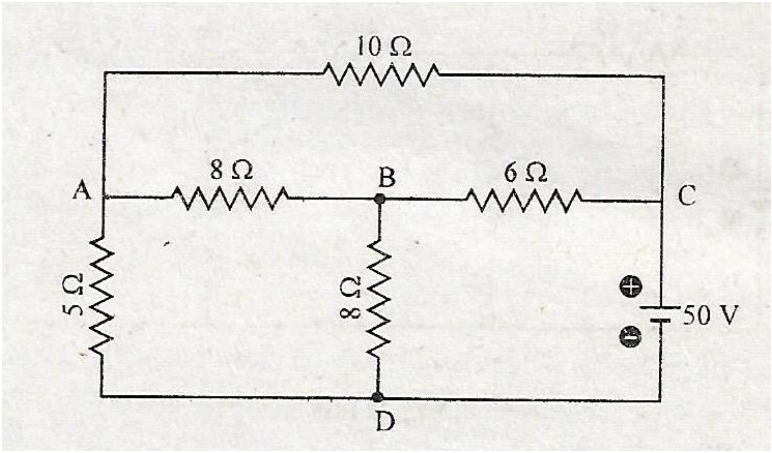
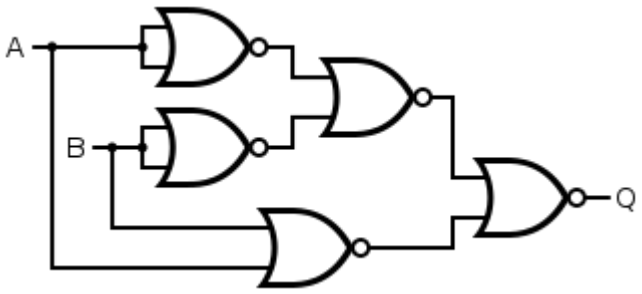
End Semester Examination, May 2018

Program: B.TECH(ECE, Chem-I&II, ASE,Electrical , PSE, ASE-AVE, APE-Gas-I &II) **Semester – II**
Subject (Course): Basic Electrical & Electronics Engineering **Max. Marks: 100**
Course Code : ECEG1001 **Duration : 3 Hrs**
No. of page/s: 04

Note : All questions are compulsory for Section A and B ,

	SECTION A		
1.	An electrically driven pump lifts 80 m^3 of water per minute through a height of 12 m . Allowing an overall efficiency of 70 % for the motor and pump , calculate the input power to motor . If the pump is in operation for an average for an average of 2 hours per day for 30 days , calculate the energy consumption in kWh and the cost of energy at the rate of Rs 3.75 per kWh . Assume of 1 m^3 of water has a mass of 1000 kg and g = 9.81 m/s^2.	**[4]**	**CO1**
2.	A 4 – pole DC Shunt Generator running at 1,500 rpm has an armature with 90 slots having 6 conductors per slot . The flux per pole is 6 X 10^{-2} Wb . Determine the induced emf of the DC Generator if the coils are lap connected . If the current per conductor is 100 A , determine the electrical power output of the machine .	**[4]**	**CO2**
3.	Explain all the types of filters used in DC-power supply design with neat sketch	**[4]**	**CO3**
4.	What is the difference between ordinary transformer and Center tapped transformer. Mention the parameters that get changed when using center tapped transformer.	**[4]**	**CO3**
5	(I) Find the equivalent resistance between points X and Y of Fig.1  **Fig.1**	**[2+2]**	**CO1, CO3**

	(II) Find the output voltage and Diode current for the following network shown in Fig 2.  **Fig.2**		
	SECTION B		
6.	A circuit having a resistance of 6 Ω and inductive reactance of 8 Ω is connected in parallel with another circuit having a resistance of 8 Ω and a capacitive reactance of 6 Ω . The parallel circuit is connected across 200 V , 50 Hz supply . Calculate : (i) supply current (ii) power factor of the whole circuit (iii) power consumed . (iv) the resistance and reactance of a series circuit which will take the same current at the same p.f. as the parallel circuit .	**[8]**	**CO1**
7.	(a) Why is a parallel circuit arrangement best for house wiring? (b) What are the disadvantages of poor power factor in a.c circuit . How we can improve the power factor for any installation/equipment ?	**[4+4]**	**CO1, CO2**
8.	A base current of 50 μA is applied to the transistor as shown in figure 3 below and a voltage of 5V is dropped across R_C . Calculate α for the transistor.  **Fig 3**	**[8]**	**CO3**
9.	Why CE-Amplifier is preferred over CC and CB? Explain working of CB-Configuration Transistor (NPN), draw the input and output characteristics and mention its applications	**[8]**	**CO3**

10.	(a) Give the analogy between electric and magnetic circuits . What are the major points of differences between them . (b) For a particular NPN transistor with Emitter bias V_{BE} = 0.7 V and β =100, R_B= 430 KΩ, R_C= 2KΩ, R_E=1 KΩ, V_{BB}= 10 V, V_{CC}= 20 V find I_B, I_C and $V_{CE.}$	**[4+4]**	**CO2, CO3**
	SECTION C **(Attempt any Two Questions)**	**2 X 20**	
11.	(a) Using Thevenin's Theorem , determine the current through 5 Ω resistance connected between terminal A and D in the network of Fig 4 below  **Fig 4** (b) The iron loss of a 80 kVA , 1000/250 V , single phase , 50 Hz transformer is 800 W . The copper loss when primary carries 50 A is 400 W . Estimate : (i) Area of cross – section of limb if working flux density is 1 wb/m2 and there are 1000 turns on the primary , (ii) Current ratio (primary and current) (iii) Efficiency at full load and 0.8 power factor lagging, (iv) Efficiency for a load when copper loss will be equal to iron loss and power factor remains 0.8 lagging	**[10,10]**	**CO32**
12	(a) Derive the output equation from the given circuit and implement the same by using logic gates.  **Fig 5**	**[10,10]**	**CO4**

	(b) Implement Full adder by using two Half adders and realize the Sum and C_{out} outputs by using NAND gates.		
13.	(a) Explain with reference to three-phase , the terms 'Phase sequence' , and 'balanced load' . What will happen if the phase sequence of the supply is changed for 3-phase induction motor . (b) A balanced three-phase star connected load is supplied from a three-phase , 400 V , 50 Hz supply . The resistance of each coil is 6 Ω and reactance is 8 Ω . Find the value of phase current , line current and the total power consumed . (c) Design a Bridge rectifier circuit for which V_{rms} is given as 81.3 V with turn's ratio 10:1. Find the DC output Voltage V_{DC}, Maximum Value of AC input V_m, Primary & secondary Voltages of Transformer V_1 & V_2 and Ripple factor. Consider the load resistor to be 1KΩ.	**(6+4+ 10]**	**CO2, CO4**

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Subject (Course): Basic Electrical & Electronics Engineering **Max. Marks: 100**
Course Code : ECEG1001 **Duration : 3 Hrs**
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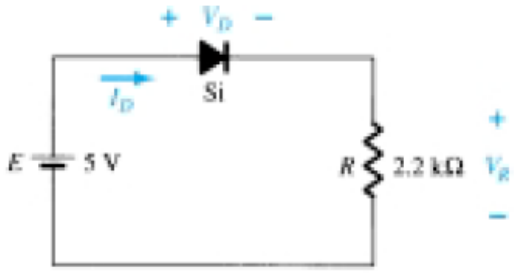
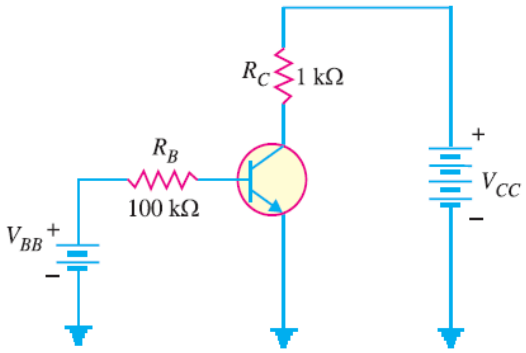
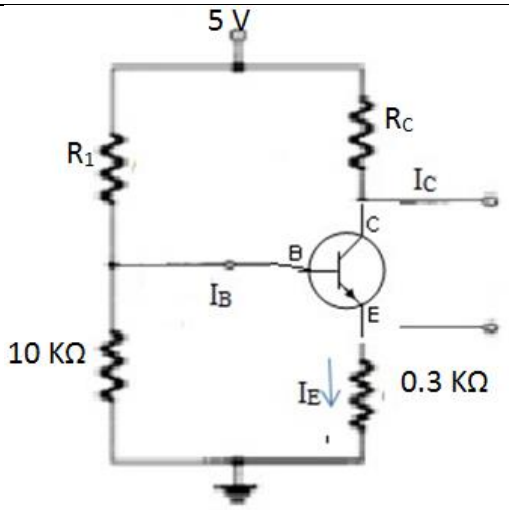
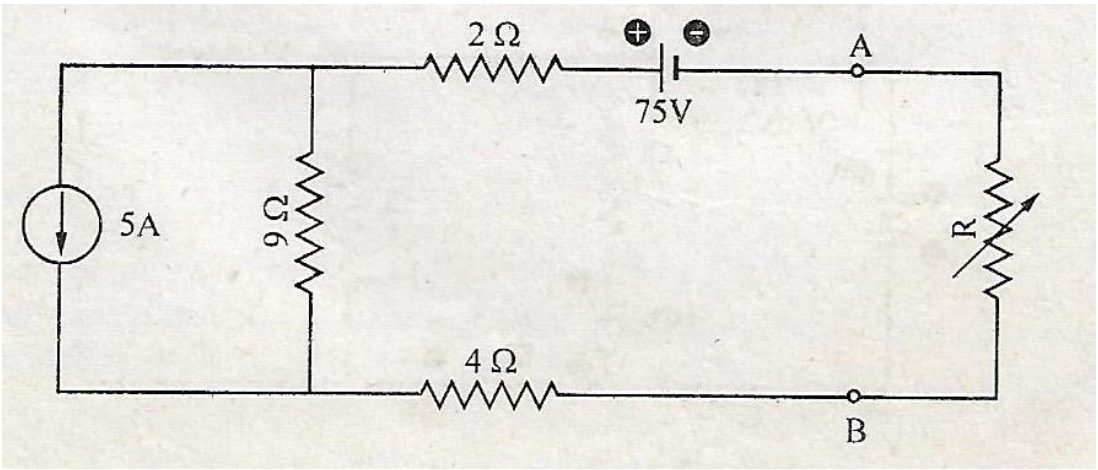
Note : All questions are compulsory for Section A and B ,

	SECTION A		
1.	An electric crane raises a load of 5 tonnes to a height of 30 meters in one minute . Calculate the HP (metric) of the motor and the current taken from a 230 v supply if the efficiency of the crane is 75 % and of the motor is 85 % .	**[4]**	**CO1**
2.	(a) A 3300/300 V single – phase 300 kVA transformer has 1100 primary turns . Find: (i) Transformation ratio (b) secondary turns (c) Voltage/turn (d) Secondary turn when it supplies a load of 200 kW at 0.8 power factor lagging	**[4]**	**CO2**
3.	Explain all the blocks used in DC-Power supply design with neat sketch.	**[4]**	**CO3**
4.	What is the difference between ordinary transformer and Center tapped transformer. Mention the parameters that get changed when using center tapped transformer.	**[4]**	
5	(I) Which of the following law/rule can be used to determine the direction of rotation of D.C. motor ? (a) Lenz's law (b) Fleming's Right Hand Rule (c) Faradays's Laws (d) Fleming's Left Hand Rule (II) The transformer ratings are usually expressed in terms of (a) volts (b) amperes (c) kW (d) kVA (III) Find I_D, V_D and V_R for the following circuit and also determine the value of the Load resistor that results in 10 mA diode current when E is considered as 7V.	**[1+1+2]**	**CO1, 2,3**

	 **Fig 1**		
	SECTION B		
6.	A balanced three – phase load of 3 kW at a power factor of 0.8 lagging is connected across a three – phase supply . If the line current is 12.5 A , calculate the resistance and reactance in each branch of the star connected load . What will be the line current and the power loss if the same load is connected in delta ?	**[8]**	**CO1**
7.	(a) Give the limitations of Superposition Theorem . (b) A series circuit consisting of resistance 10 Ω , inductive reactance 20 Ω and capacitive reactance Xc Ω , is connected to 100 V , 50 Hz supply . It is observed that current in the circuit is maximum . Find , (i) The value of capacitance and inductance in the circuit (ii) The impedance of the circuit (iii) Power factor of the circuit (iv) The value of maximum current . (v) Power consumed by the circuit .	**[2,6]**	**CO1**
8.	A base current of 50 μA is applied to the transistor as shown in figure 2 and a voltage of 5V is dropped across R_C . Calculate α for the transistor.  **Fig 2**	**[8]**	**CO3**
9.	The BJT amplifier shown in the figure has $\mathbf{h_{fe}}$ =100, V_{BE}=0.7V. Calculate the value of R_1 and R_C such that its I_C=1mA and V_{CE}=2.5 V	**[8]**	**CO3**

	 **Fig 3**		
10.	(a) Derive an expression for induced e.m.f. in a transformer in terms of frequency , the maximum value of flux and the number of turns on the windings (b) What is PN-junction Diode? Discuss the behavior of a PN junction under forward and reverse biasing and also sketch V-I characteristics of a PN Junction.	**[4+4]**	**CO2**
	SECTION C **(Attempt any Two Questions)**	**2 X 20**	
11.	(a) A mercury vapour lamp unit consists of a 25 μF condenser in parallel with a series circuit containing the resistive lamp and reactor of negligible resistance . The whole unit takes 400 W at 240 V , 50 Hz and unity power factor . What is the voltage across the lamp ? (b) Find the value of adjustable R which results in maximum power transfer across the terminal A – B of the circuit show in Fig 4 below and determine the maximum power .  **Fig 4**	**[10+10]**	**CO1, 2**
12	A) Derive the Boolean equations for F1 and F2, minimize the equations by using Boolean laws and Design the circuit by using logic gates.		**CO4**

	<table><tr><th>A</th><th>B</th><th>C</th><th>F_1</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr></table> <table><tr><th>A</th><th>B</th><th>C</th><th>F_2</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></table> B) Implement a Full adder by using two Half adders and realize the Sum and C_{out} outputs by using NAND gates.		
13.	(a) Explain the principle of operation of dc motors , What is back emf in dc motors ? What is its significance ? (b) Convert the following i. $(F67.5A)_{16} = (\quad)_8$ ii. $(101011.1001)_2 = (\quad)_{10}$ iii. $(9309.124)_{10} = (\quad)_{16}$ iv. $(101011)_8 = (\quad)_2$ v. $(679)_8 = (\quad)_{10}$ (c). For a particular NPN transistor with Emitter bias V_{BE} = 0.7 V and β =200, R_B= 50 KΩ, R_C= 300Ω, R_E=10 KΩ, V_{BB}= 10 V, V_{CC}= 20 V find I_B, I_C and V_{CE}		**CO2, CO4**

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