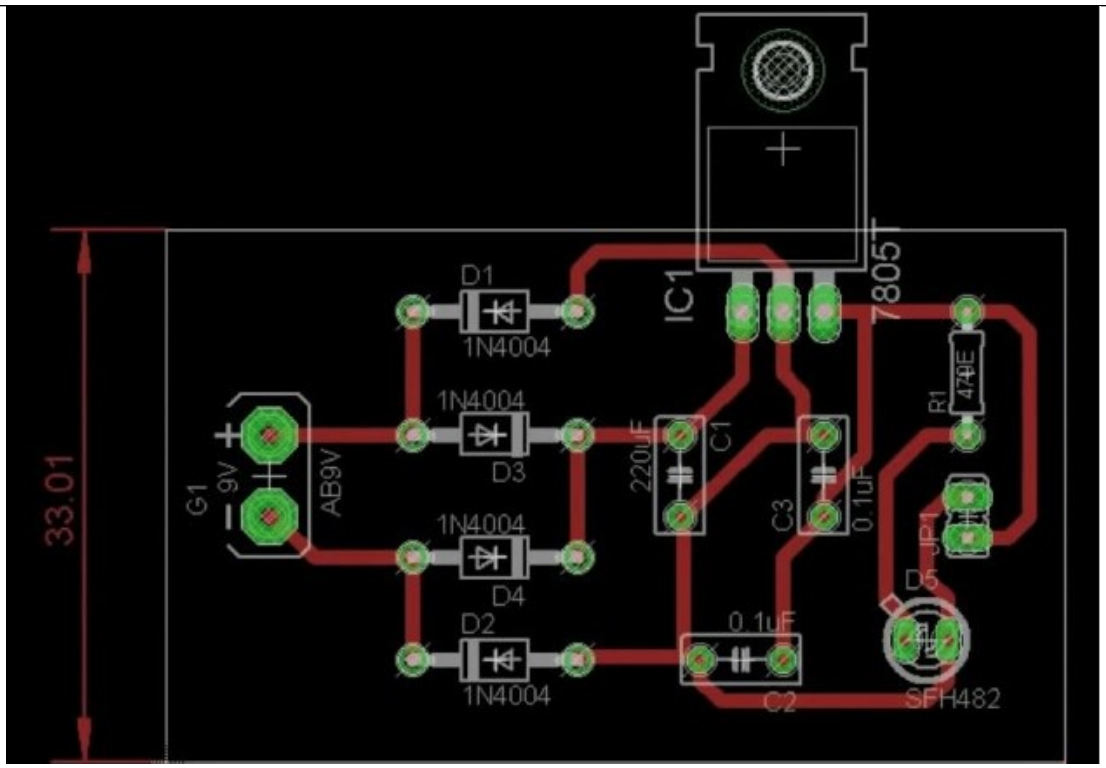
Name: Enrolment No:	UPES

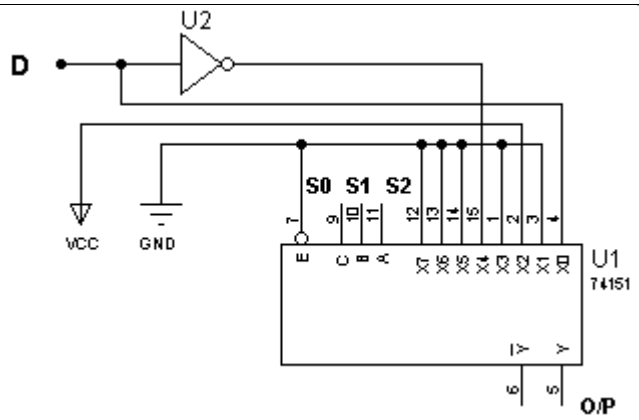
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018
SET-I

Course: Automation & Robotics Engineering **(**ECEG 2014) **Semester: I**
Programme: M.Tech
Time: 03 hrs. **Max. Marks: 100**
Instructions:

SECTION A

S. No.		Marks	CO
Q 1	Discuss the various filter circuits used for embedded circuits. Also draw the circuit.	**4**	**CO1**
Q 2	Discuss in brief the different power supply circuit used to drive a hex- robot	**4**	**CO2**
Q 3	Discuss the role of capacitor and freewheeling diode in reducing back EMF from DC motor. Draw the circuit to support your answer.	**4**	**CO2**
Q 4	Discuss the rules to design analog and digital circuits in printed circuit boards.	**4**	**CO3**
Q 5	Discuss how the cost of processor increases if design is based on increasing speed of a processor. Calculation should base on mathematical expression.	**4**	**CO3**
	SECTION B		
Q 6	Design a BJT based amplifier using βre model. Calculate the input and output impedances, voltage gain and current gain. Consider the R_E (Emitter resistor) resistor if using self-bias or voltage divider bias based BJT amplifier.	**10**	**CO1**
Q 7	List out the aspects for designing the power supply for heavy payload applications with the help of BJT transistors and MOSFET.	**10**	**CO2**
Q 8	Design and explain ULN2003 IC and explain the concept of using this driver IC to drive stepper motor.	**10**	**CO3**
Q 9	Below is the PCB design of power supply unit of a tiny robot. Comment on the flaws of the design	**10**	**CO3**

	 Fig. 1 **OR**		
Q 10	Design a relay based circuit and opto coupler based circuit to drive a robot. List out the advantages and disadvantages using relay and Opto coupler based driver circuits.	**10**	**CO2**
	SECTION-C		
Q 11	Design a white light (from flash light) tracking circuit for a Robot that will track the white light in real time.	**20**	**CO5**
Q 12	1. The circuit shows how an 8-bit MUX can be used to generate a four-variable logic function even though the MUX has only 3 SELECT inputs. (a) Setup a truth table showing the output Y for the 16 possible combinations of input variables. (b) Write the sum-of-products expression for Y and simplify it to verify that $\mathbf{Y}=\acute{C}\mathbf{B}\acute{A} + \mathbf{D}\acute{C}\acute{B}\acute{A} + \acute{D}\mathbf{C}\acute{B}\acute{A}$	**20**	**CO3**


U2
D
VCC
GND
S0
S1
S2
U1
74151
O/P

Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
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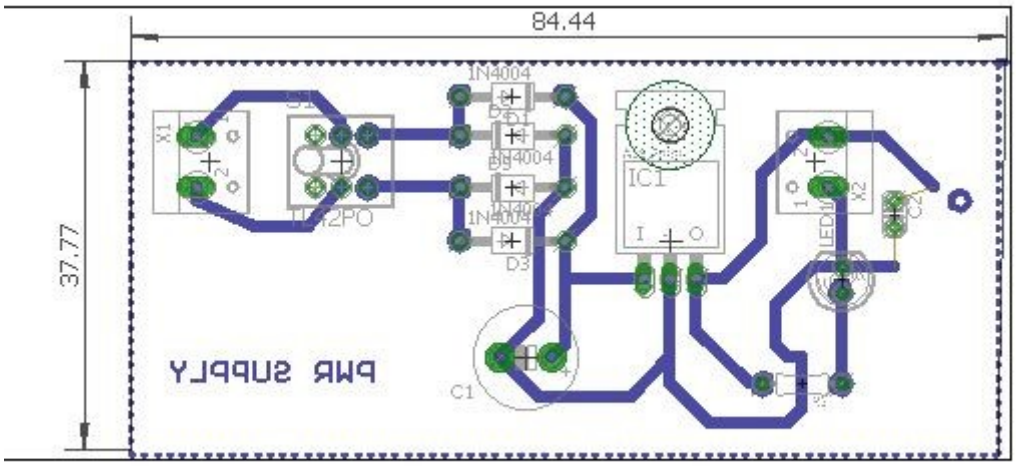
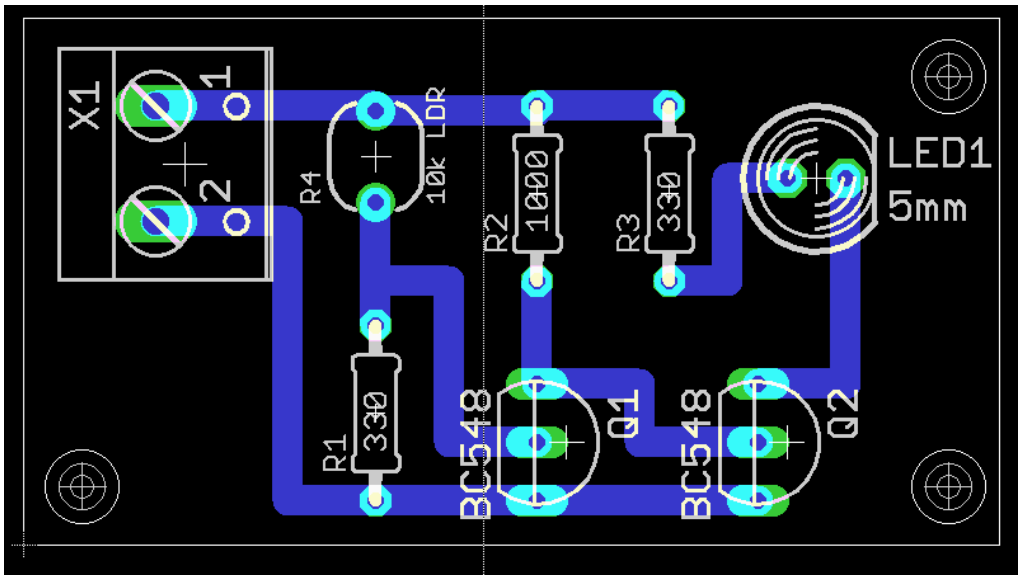
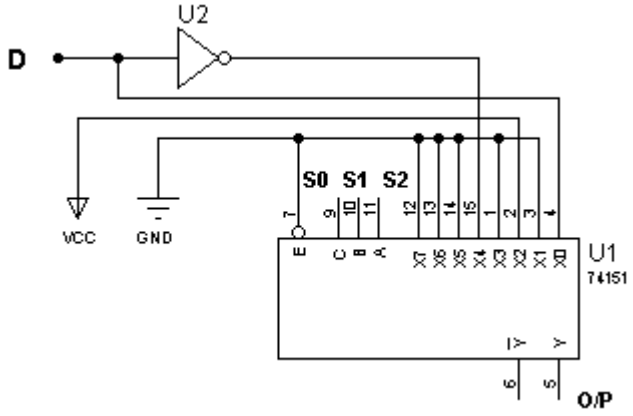
SET-II

Course: Automation & Robotics Engineering **(**ECEG 2014) **Semester: I**
Programme: M.Tech
Time: 03 hrs. **Max. Marks: 100**
Instructions:

SECTION A

S. No.		**Marks**	**CO**
Q 1	Discuss the various filter circuits used for embedded circuits. Also draw the circuit.	**4**	**CO5**
Q 2	Discuss in brief the 5V buck converter power supply circuit used to drive robot.	**4**	**CO2**
Q 3	Discuss the role of capacitor and freewheeling diode in reducing back EMF from DC motor. Draw the circuit to support your answer.	**4**	**CO2**
Q 4	Discuss the rules to design the analog circuits in printed circuit boards.	**4**	**CO3**
Q 5	Discuss how the cost of processor increases if design is based on increasing speed of a processor. Calculation should base on mathematical expression.	**4**	**CO3**
	SECTION B		
Q 6	Design a BJT based amplifier using βre model. Calculate the input and output impedances, voltage gain and current gain. Consider the R_E (Emitter resistor) resistor if using self-bias or voltage divider bias based BJT amplifier.	**10**	**CO1**
Q 7	Below is the two PCB designs of power supply units. Comment on the flaws of the design		**CO2**

	 Fig 1  Fig 2		
Q 8	Design and explain ULN2003 IC and explain the concept of using this driver IC to drive stepper motor.	**10**	**CO3**
Q 9	Apply the fundamental rules of designing printed circuit board and explain how the power supply section of PCB is designed and managed for 2A of current. **OR**	**10**	**CO2**
Q 10	In a certain chemical processing plant, a liquid chemical is used in a manufacturing	**10**	**CO3**

	process. The chemical is stored in three different tanks. A level sensor in each tank produces a high voltage when the level of chemical in the tank drops below a specified point. Design a circuit that monitors the chemical level in each tank and indicates when the level in any two of the tanks drops below the specified point.		
	SECTION-C		
Q 11	Design a white light (from flash light) tracking circuit for a Robot that will track the white light in real time.	**20**	**CO5**
Q 12	The circuit shows how an 8-bit MUX can be used to generate a four-variable logic function even though the MUX has only 3 SELECT inputs. (c) Setup a truth table showing the output Y for the 16 possible combinations of input variables. (d) Write the sum-of-products expression for Y and simplify it to verify that $\mathbf{Y}=\acute{C}\mathbf{B}\acute{A} + \mathbf{D}\acute{C}\acute{B}\acute{A} + \acute{D}\mathbf{C}\acute{B}\acute{A}$  	**20**	**CO3**