Name: **Enrolment No:**	UPES

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

Coursee: Basic Electronics Engineering (PHYS-1003) **Semester: I**

Programme: B.Tech (CIT: IOT, Big Data, DevOps, CSF, Cyber Law/IPR, OGI, OSS, Ai&ML)

Time: 03 hrs. **Max. Marks: 100**

Instructions:

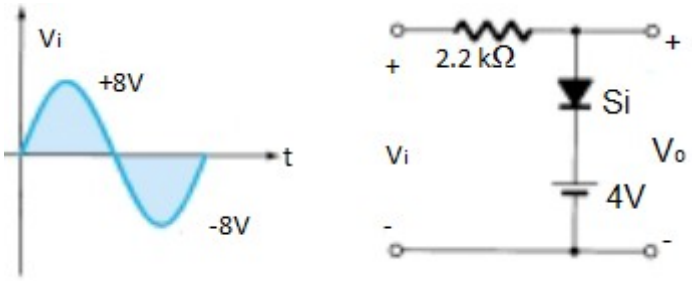
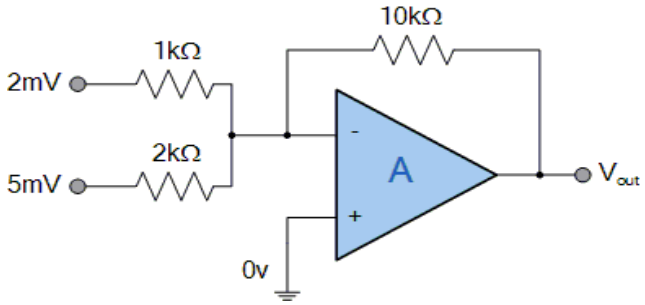
1. **Draw suitable circuit diagrams wherever required to justify your answer.**
2. **Your answer should be concise and to the point.**

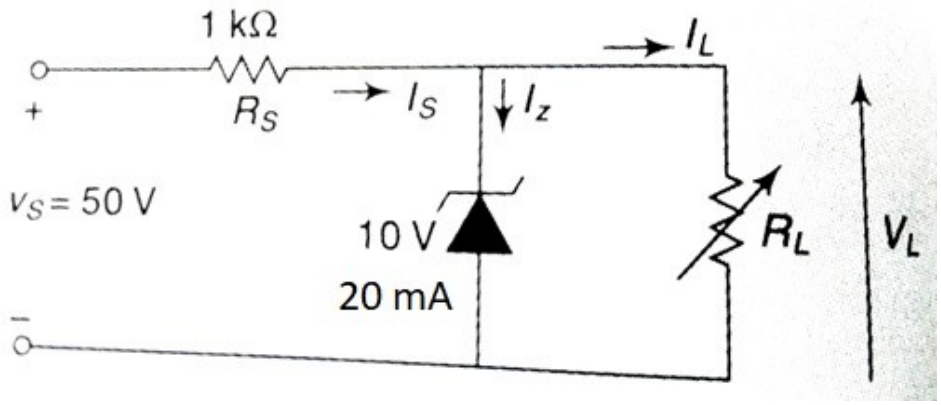
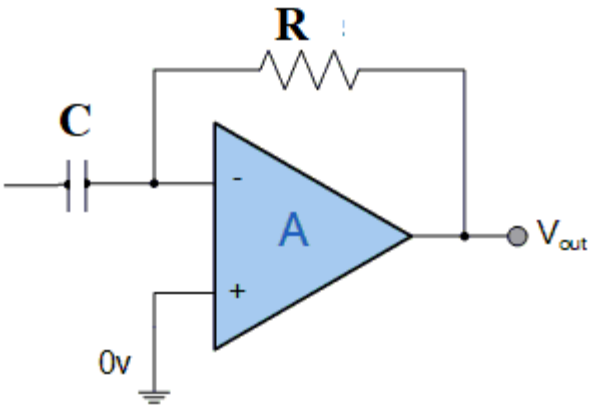
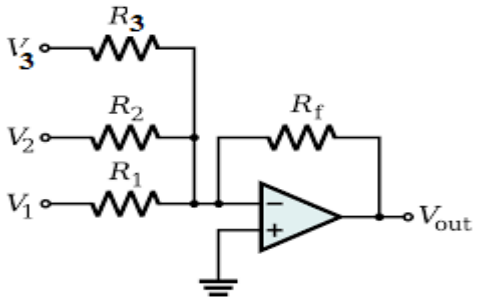
SECTION A
(All questions are compulsory.)

1.	Describe the difference between donor and acceptor impurities.	[4]	CO1
2.	Discuss with the help of a circuit diagram, how a zener diode can be used as a voltage regulator.	[4]	CO1
3.	A center-tapped full wave rectifier has the load resistance R_L= 2000 ohm. The forward resistance R_F of each diode is 20 ohm. The voltage across half of the secondary winding is given by the equation V = 400sin*14t*. Calculate the Maximum current, Direct current and ripple factor.	[4]	CO1
4.	Determine the current gain, α_{dc} if emitter current, I_E=2.8 mA and base current, I_B =20 µA.	[4]	CO2
5.	An amplifier operating over the frequency range from 10 to 18 MHz has a 8 kΩ input resistor. What is the rms noise voltage at the input to this amplifier if the ambient temperature is 27°C? (Boltzmann constant, k = 1.38 x 10^{-23} J/K)	[4]	CO4

SECTION B
(All questions are compulsory. Question no. 7 has internal choice.)

6.	(a) Using diode equation, determine the diode current at 20°C for a silicon diode with I_s= 50 nA and an applied forward bias of 0.6 V. (b) Calculate the value of thermal voltage at room temperature. (Boltzmann constant, k = 1.38 x 10^{-23} J/K)	[5 + 5]	CO1
7.	Discuss the construction and working of common base transistor amplifier, write the expression for current gain and emitter current. Also draw the input and output characteristics. OR Explain the construction and working of depletion mode of depletion type MOSFET with the help of a suitable diagram.	[10]	CO2
8.	How the Amplifiers can be classified based on the operating point? Which types of	[8+2]	CO3

	operational amplifier have maximum efficiency and maximum conduction angle?		
9.	Discuss the frequency Modulation superhetrodyne receiver by explaining the function of each stage with the help of a suitable block diagram.	[10]	CO4
	SECTION C **(Q10 and Q11 are compulsory. Attempt any set of Q12, 13 & 14.)**		
10.	What do you understand by the term noise? Give a detailed discussion on the different types of noises that occurs in communication system.	[3 + 7]	CO4
11.	Draw the circuit diagram of integrator and differentiator and derive the expression for the output voltage of an integrator.	[5 + 5]	CO3
12.	Determine Vo for the circuit shown below: 	[10]	CO1
13.	Design an adder circuit using Operational amplifier to give the output $V_o = -(3V_1 + 4V_2 + 5V_3)$ where V_1, V_2 and V_3 are the inputs and $R_f = 20k\Omega$	[5]	CO3
14.	Find the output voltage for the given circuit 	[5]	CO3
	OR		
12.	(i) A Zener regulated circuit is shown in the figure. Find the range of load resistance to maintain a constant V_L. Assume Zener is an ideal one of rating 10V and the maximum zener current is 20 mA. Also find the maximum power consumed by Zener.	[10]	CO1

13.	 For a given circuit, R=1 MΩ and C=1μF. If a signal Vi=4sin2000πt in mV is used as input voltage, Calculate the output Voltage.	[5]	CO3
14.	 The amplifier shown in figure has R_f=5 kΩ, R_1=5 kΩ, R_2=11.2 kΩ and R_3= 3.3 kΩ. If V_1= 6 V, V_2= -3 V, V_3= -0.75 V. Find V_{out} 	[5]	CO3

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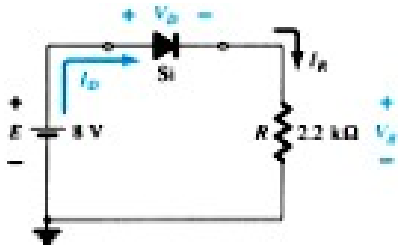
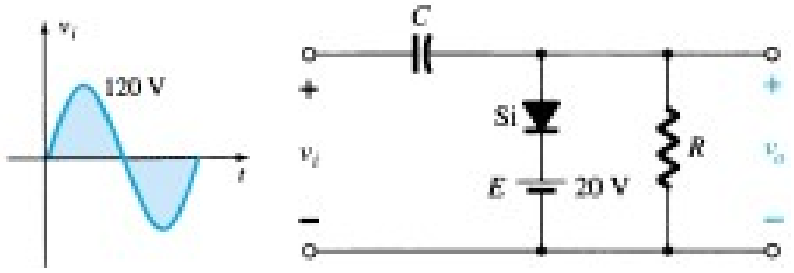
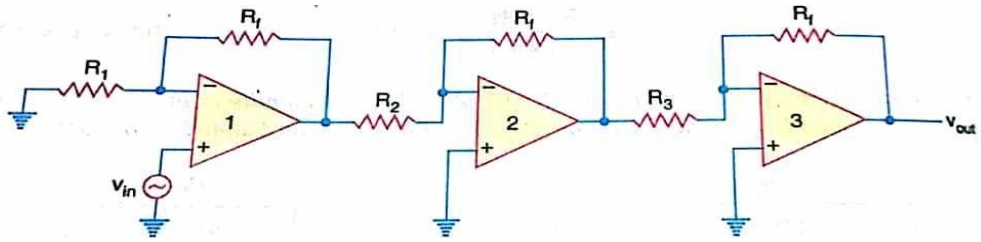
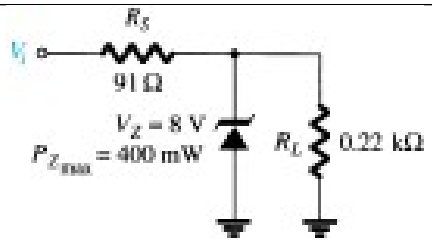
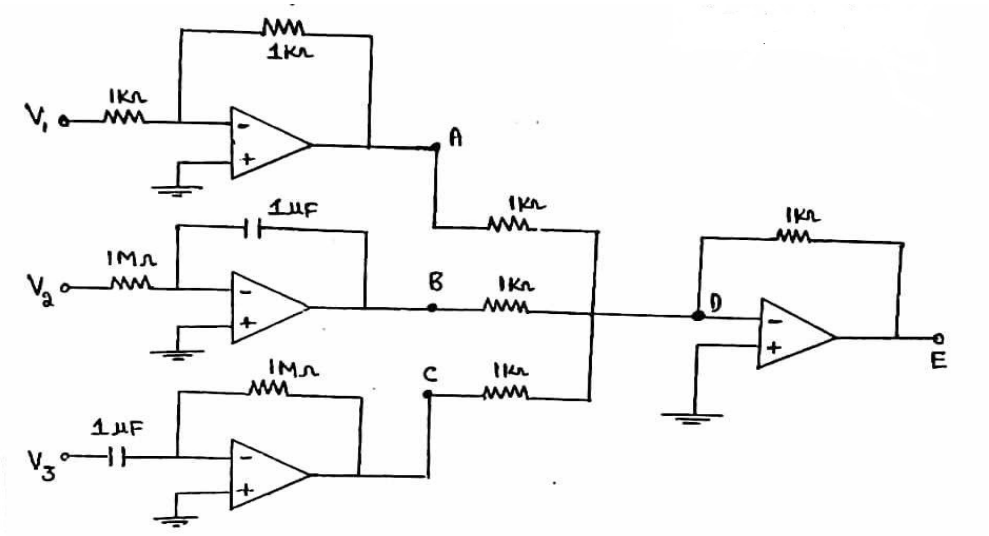
SECTION A
(All questions are compulsory.)

1.	What do you understand by the terms 'drift' and 'diffusion' for a semiconductor? Write the expression for total current density.	[4]	CO1
2.	Write the steps in determining the output waveform from an unbiased clamper.	[4]	CO1
3.	For the series diode configuration of given circuit determine V_D, V_R, and I_D. 	[4]	CO1
4.	If Current gain β_{dc}=180 and collector current I_C =2.0 mA, find Emitter current and base current.	[4]	CO2
5.	Calculate the noise voltage at the input of a television RF Amplifier using a device that has a 200 ohm equivalent noise resistance and 100 Ohm input resistor. The bandwidth of the amplifier is 4 MHz and the temperature is 15 °C. (Boltzmann constant, k = 1.38 x 10^{-23} J/K)	[4]	CO4

SECTION B
(All questions are compulsory. Question no. 7 has internal choice.)

6.	(a) Discuss the effect of biasing on the width of depletion layer of PN junction diode. (b) A sample of intrinsic silicon has 0.13 and 0.05 m^2/V-s electron and hole mobilities respectively at 300K. If the density of electrons and holes are each equal to 1.5 x 10^{16} m^{-3} at 300K, find the electrical conductivity for addition of 1 donor impurity atom in 10^9 silicon atoms.	[5 + 5]	CO1
7.	Draw the output characteristics of a common emitter transistor configuration. Describe a load line and discuss the significance of an operating point. OR	[10]	CO2

	Explain the construction and working of enhancement mode of depletion type MOSFET with the help of a suitable diagram.		
8.	Write the characteristics of an ideal operational Amplifier. Draw the circuit diagram of op-amp as summer and find out the expression for the output voltage.	[10]	CO3
9.	Explain the importance of modulation and demodulation in communication system with their definitions and discuss different types of modulation along with diagram.	[10]	CO4
	SECTION C **(Q10 and Q11 are compulsory. Attempt any set of Q12 & 13.)**		
10.	Discuss the Amplitude Modulation superhetrodyne receiver by explaining the function of each stage with the help of a suitable block diagram.	[10]	CO4
11.	Explain the advantage of negative feedback over positive feedback and derive the relation for overall voltage gain of amplifier with negative feedback.	[10]	CO3
12.	Sketch the output waveform from the following clamper network for the given input signal: 	[10]	CO1
13.	Find the output voltage for an input voltage of 80 μV for the given circuit The resistor values are R_f= 470kΩ , R_1 = 4.3 KΩ, R_2= 33 KΩ and R_3 = 33 KΩ 	[10]	CO3
	OR		
12.	Determine the range of Vi that will maintain V_L at 8 V and not exceed the maximum power rating of Zener diode.	[10]	CO1

			
13.	Find the expression for the output voltage at points A, B, C, D and E in the circuit shown below. 	[10]	CO3