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PESIT Bangalore South Campus

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Department of Basic Science and Humanities

CIE TEST -2

Date : 03-04-2018	Marks: **60**
Subject & Code : **Basic Electronics – 17ELN25**	Sec : F,G,H,I,J
Name of faculty : Prof.KB, SB & UB	Time : 8.30AM-10.00AM

	Note: Answer FIVE full questions, selecting any ONE full question from each part.	**Marks**
	PART 1	
1	Explain the logic gates with truth table, characteristic equation and symbols.	**12**
2	A) Simplify using Boolean algebra laws and Truth table method F = ABC+A'B'C+A'BC+A'B'C B) Prove that **(x + y) * (x + z) = x + yz** using Boolean algebra laws and Truth table method.	**6+6**
	PART 2	
3	Explain the Accurate Analysis of Voltage Divider Bias Circuit with neat diagrams.	**12**
4	For a Voltage Divider Bias circuit, V_{CC} = 15V, R_C = 2.7 KΩ, R_E = 2.2 KΩ, V_{BE} = 0.7V, R_1 = 22 KΩ, R_2 = 12 KΩ. Calculate I_C, V_E , V_C & V_{CE}. Draw the DC Load line & indicate the Q point.	**12**
	PART 3	
5	Implement using NAND and NOR gates **A)** XOR gate **B)** XNOR gate	**6+6**
6	Using 1's and 2's Complement method, subtract the following: **A)** $(FE)_{16}$ - $(BC)_{16}$ **B)** $(111)_2$ - $(10010)_2$ **C)** $(12.56)_{10}$ - $(8.12)_{10}$	**4+4+4**

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	PART 4	
7	**A)** Explain a Voltage Follower Circuit. **B)** Explain how an op-amp works like a differentiator. **C)** Explain the properties of an ideal op-amp.	**4+4+4**
8	**A)** Calculate the output voltage of a 4-input summing amplifier : R_1 = **10 KΩ**, R_2 = **20 KΩ**, R_3 = **30 KΩ**, R_4 = **40 KΩ**, R_F = **10 KΩ**, V_1 = **-1V**, V_2 = **2V**, V_3 = **3V**, V_4 = **-2V.** **B)** Calculate the input voltage required for an inverting op-amp that has R_F = **10 KΩ**, R_1 = **1 KΩ** and V_O = **2 V**.	**6+6**
	PART 5	
9	Convert the following numbers: A) $(110.1101)_2$ to $(\ )_{10}$ B) $(0.728)_{10}$ to $(\ )_8$ C) $(31C.DE)_{16}$ to $(\ )_{10}$ D) $(53.4375)_{10}$ to $(\ )_2$ E) $(11010.101)_2$ to $(\ )_{16}$ F) $(124.21)_8$ to $(\ )_{10}$	**12**
10	**A)** Explain the Full Adder Circuit with neat diagrams. **B)** State and Prove De-Morgan's Theorem for 3 variables.	**6+6**

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Name of faculty : Prof.KB, SB & UB	Time : 8.30AM-10.00AM

	Note: Answer FIVE full questions, selecting any ONE full question from each part.	**Marks**
	PART 1	
1	**Explain the logic gates with truth table, characteristic equation and symbols.** ***Ans)*** *Explanation + Symbol + Truth table +Characteristic equation* ***[3+3+3+3 marks]***	**12**
2	A) **Simplify using Boolean algebra laws and Truth table method** **F = ABC+A'B'C+A'BC+A'B'C** ***Ans)*** *F = C (A' + B)* *Simplication + Truth Table method* ***[3+3 marks]*** B) **Prove that (x + y) * (x + z) = x + yz using Boolean algebra laws and Truth table method.** ***Ans)*** *Proof + Truth Table method* ***[3+3 marks]***	**6+6**
	PART 2	
3	**Explain the Accurate Analysis of Voltage Divider Bias Circuit with neat diagrams.** **Ans)** *Circuit diagram 1 (with resistors R1 and R2)* *Circuit diagram 2 (with V_T & R_T)* *Derivation + Explanation* ***[3+3+3+3 marks]***	**12**
4	**For a Voltage Divider Bias circuit, V_{CC} = 15V, R_C = 2.7 KΩ, R_E = 2.2 KΩ, V_{BE} = 0.7V, R_1 = 22 KΩ, R_2 = 12 KΩ. Calculate I_C, V_E, V_C & V_{CE}. Draw the DC Load line & indicate the Q point.**	**12**

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	Ans) $V_B = 5.29\ V,\ V_E = 4.59\ V,\ I_E = I_C = 2.09\ mA,$ $V_{CE} = 4.76\ V,\ V_C = 9.35\ V$ *DC Load Line :* *X axis (point A) = 15 V* *Y axis (point B) = 3.06 mA* *Q point = (4.76 V, 2.09 mA)* *Calculation of I_C, V_E, V_C & V_{CE}* ***[2+2+2+2 marks]*** *DC Load Line & Q point* ***[2+2 marks]***	
	PART 3	
5	**Implement using NAND and NOR gates** **A) XOR gate** **B) XNOR gate** ***Ans)*** *XOR using NAND & NOR* ***[3+3 marks]*** *XNOR using NAND & NOR* ***[3+3 marks]***	**6+6**
6	**Using 1's and 2's Complement method, subtract the following:** ***A)*** **$(FE)_{16} - (BC)_{16} = (42)_{16}$** ***[1's Complement = 2 marks + 2's Complement = 2 marks]*** ***B)*** **$(111)_2 - (10010)_2 = (-01011)_2$** ***[2+2 marks]*** ***C)*** **$(12.56)_{10} - (8.12)_{10} = (4.44)_{10}$** ***[2+2 marks]***	**4+4+4**
	PART 4	
7	**A) Explain a Voltage Follower Circuit.** ***Ans)*** *Circuit Diagram + Derivation* ***[2+2 marks]***	**4+4+4**

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	B) Explain how an op-amp works like a Differentiator. *Ans) Circuit Diagram + Derivation* ***[2+2 marks]*** **C) Explain the properties of an Ideal Op-amp.** *Ans) Minimum 4 properties to be explained.* ***[1 Mark each]***	
8	**A) Calculate the output voltage of a 4-input summing amplifier :** R_1 **= 10 KΩ**, R_2 **= 20 KΩ**, R_3 **= 30 KΩ**, R_4 **= 40 KΩ**, R_F **= 10 KΩ**, V_1 **= -1V**, V_2 **= 2V**, V_3 **= 3V**, V_4 **= -2V.** *Ans) Vo = [(-0.5)V - if inverting summing op –amp (or)* *(0.5)V - if non-inverting summing op –amp]* *Circuit Diagram + Calculation with formula* ***[3+3 marks]*** **B) Calculate the input voltage required for an inverting op-amp that has** R_F **= 10 KΩ,** R_1 **= 1 KΩ** and V_O **= 2 V**. **Ans)** $V_i = 0.2\ V$ *Circuit Diagram + Calculation with formula* ***[3+3 marks]***	**6+6**
	PART 5	
9	**Convert the following numbers:** A) **(110.1101)** $_2$ **to** $(6.8125)_{10}$ *B)* **(0.728)** $_{10}$ **to** $(0.5645)_8$ C) **(31C.DE)** $_{16}$ **to** $(796.8671875)_{10}$ *D)* **(53.4375)** $_{10}$ **to** $(110101.0111)_2$ *E)* **(11010.101)** $_2$ **to** $(1A.A)_{16}$ F) **(124.21)** $_8$ **to** $(84.265625)_{10}$ ***[2+2+2+2+2+2 marks}***	**12**

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10	**A) Explain the Full Adder Circuit with neat diagrams.** ***Ans)*** *Logic gate circuit diagram & Block diagram + Truth table +Characteristic equation* ***[2+2+2 marks]*** **B) State and Prove De-Morgan's Theorem for 3 variables.** ***Ans)*** *2 Statements + proof using any method (Truth Table)* ***[2+2+2 marks]***	**6+6**