Graphic Era HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

End Term (Odd) Semester Examination December 2024

Roll no.....

Name of the Course and semester: B.Tech (Semester 1)
Name of the Paper: Basic electronics engineering
Paper Code: TEC 101
Time: 3 hour Maximum Marks: 100

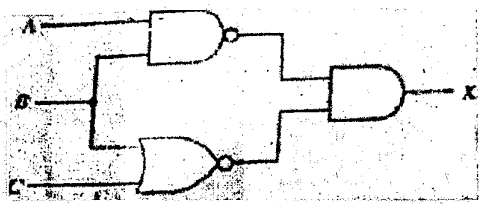
Note:
(i) All the questions are compulsory.
(ii) Answer any two sub questions from a, b and c in each main question.
(iii) Total marks for each question is 20 (twenty).
(iv) Each sub-question carries 10 marks.

Q1. (2X10=20 Marks) **CO1**

a.
i) $(65)_7 = (?)_{10} = (?)_2 = (?)_{16} = (?)_8 = (?)_9$

ii) If $(32)_X + (24)_Y = (44)_6$, & $(31)_X + (13)_Y = (41)_5$, find the value of base X and base Y

b.
i) Express the output x of given circuit in canonical SOP form.



ii) Simplify using Boolean rules $X \oplus Y \oplus \overline{XY}$

c. Minimize the following by K map and realize the minimized expression by
i) NAND gates only ii) NOR gates only
$F(A, B, C, D) = \Sigma m (1, 3, 4, 5, 6, 7, 9, 11, 15)$

Q2. (2X10=20 Marks) **CO2**

a. Explain mass action law of semiconductors. If N_D and N_A are donor and acceptor impurities and n_i is the intrinsic concentration, establish the relation for minority and majority charge densities in extrinsic semiconductors.

b. Explain Avalanche breakdown and Zener breakdown mechanism. Also mention the differences among them.

c. In a Ge pn junction, donor concentration is 1000 times the acceptor concentration. If the acceptor impurity is added at the rate of 1 atom per 10^8 Ge atoms. Calculate built in potential at room temperature if density of Ge is $4.4 \times 10^{26}/cm^3$ and intrinsic concentration is $2.5 \times 10^{13}/cm^3$

Q3. (2X10=20 Marks) **CO3**

a. With the help of circuit diagram and suitable waveforms, explain working of a Bridge rectifier. Also derive the expression for rms vale of its load current.
b. What is the need of filter in a power supply? With the help of neat circuit diagram and waveforms, explain working of capacitor filter.

c. A 100V,50Hz ac signal is applied to the primary winding of a 5:1 step down transformer used in a half wave rectifier. If the diode used has a resistance of 100Ω and load resistance is 1KΩ

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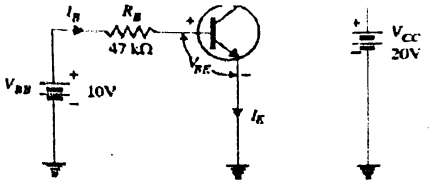
i) Draw circuit for given data
ii) Determine rms value of load current
iii) Determine Output power delivered to load
iv) Determine Rectifier efficiency

Q4. (2X10=20 Marks) **CO4**

a. With the help of circuit diagram and suitable graph, explain input and output characteristics of a common base transistor.

b. Derive relation between dc current gain α and β of a transistor.
In a common base connection, the emitter current is 10mA. Given that α = 0.99, determine the collector current, base current and β

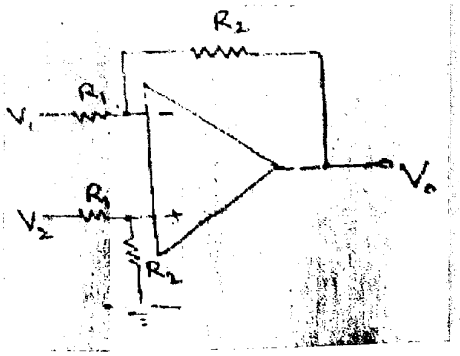
c. Determine I_B, I_C, V_{CE} of the transistor circuit shown in Fig.
Given β = 200 and V_{BE} = 0.7V



Q5. (2X10=20 Marks) **CO5**

a.
i) List characteristics of an ideal OP-AMP
ii) Draw circuit diagram of a non-inverting amplifier using OP-AMP and derive expression for its output voltage.

b. Derive the expression for output voltage Vo for the circuit shown in figure.
Determine output voltage if
V_1=7V, V_2=4V, R_1=5KΩ, R_2=15KΩ



c. Determine the V_X and output voltage V_O for the circuit shown in figure