USDSEPHT14 - Physics Paper-II : Digital & Analog Circuits and Instrumentation

P. Pages : 2

Time : Three Hours

6762

GUG/W/23/13366

Max. Marks : 50

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Notes : 1. All questions are compulsory.
2. Draw well labelled diagram wherever necessary.

Either:

1. a) i) Write the truth table for Half Adder and explain its working with the neat circuit diagram. **2**

   ii) Explain the working of Full Adder with the help of block diagram and write its truth table. **6**

   iii) Perform the following binary subtraction by 1's compliment method. **2**
   a) 10011 -- 10001   b) 10110 – 1111

   OR

   b) i) Distinguish between analog and digital circuits. **2½**

   ii) Convert following binary numbers to its decimal equivalents. **2½**
   a) $(11001)_2$ b) $(1011.0101)_2$

   iii) Convert following Hexadecimal to equivalent decimal numbers. **2½**
   a) $(127)_{16}$ b) $(FCB)_{16}$

   iv) State and prove De-Morgan's Theorems. **2½**

Either:

2. a) i) What are Intrinsic and Extrinsic semiconductors? **2**

   ii) Explain N-type and P-type semiconductor. **4**

   iii) Explain the Volt-Ampere characteristics of PN junction diode. **4**

   OR

   b) i) Explain the construction and working of bridge rectifier. **2½**

   ii) Why filter is necessary for the rectifier? Explain the working of $\pi-$section filter. **2½**

   iii) Explain the working of Zener diode as a voltage regulator. **2½**

   iv) A full wave rectifier uses two diodes having internal resistance 20 ohm each. The transformer r.m.s. secondary voltage from center tap to each end of secondary is 50 V and load resistance is 980 ohm.
   Find the i) mean load current ii) r.m.s. value of load current **2½**

Either:

3. a) i) Explain the construction & working of NPN transistor. **4**

ii) With the neat circuit diagram, explain the characteristics of NPN transistor in common emitter mode. **4**

iii) Calculate the emitter current in transistor for which $\beta = 50$ and $I_B = 20\mu A$. **2**

OR

b) i) Explain the working of transistor as a CE amplifier with graphical analysis. **2½**

ii) Compare class-A and class-B amplifier. **2½**

iii) Explain the working of RC coupled amplifier. **2½**

iv) For the transistor $\alpha = 0.98$ which carries emitter current of 12mA. Find I_C, I_B. **2½**

Either:

4. a) i) With the neat circuit diagram explain the working of difference amplifier. **6**

ii) Why difference amplifier needs two power supplies. **2**

iii) Define input bias current and input offset current. **2**

OR

b) i) Explain the working of OPAMP as an Integrator. **2½**

ii) Explain the working of OPAMP as an Adder. **2½**

iii) Explain the working of OPAMP as an inverting amplifier. **2½**

iv) Resistance of 1M ohm and capacitance of $1\mu F$ is used for the OPAMP differentiator. What would be noise voltage at the output of it if input noise frequency is 1 MHz and the amplitude of the input noise voltage is $1\mu V$. **2½**

5. Attempt **any ten** of the following.

a) Draw the symbol for EX-OR gate and write its truth table. **1**
b) Draw the circuit diagram of Half subtractor. **1**
c) Draw the logical circuit for Boolean equation $Y = AB + \overline{C}$. **1**
d) What is Photocell? **1**
e) Define static resistance and dynamic resistance. **1**
f) Define rectifier. **1**
g) Define current gain α and β. **1**
h) Define stability factor of transistor. **1**
i) A change of 200m V in base-emitter voltage causes change of $100\mu A$ in the base current. Find input resistance of transistor. **1**
j) Define CMRR **1**
k) State characteristics of an ideal OPAMP. **1**
l) Give the pin configuration of OPAMP IC-741. **1**

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