2024/05

SET A

M.Sc. PHYSICS
SECOND SEMESTER
ELECTRONICS
MSP – 203

[USE OMR FOR OBJECTIVE PART]

Duration: 1:30 hrs. **Full Marks: 35**

Objective

Time: 15 mins. **Marks: 10**

Choose the correct answer from the following: ***1×10=10***

1. If the doping in the P region is high then N region:
   a. Depletion layer will be more towards P
   b. Depletion layer will be more towards N
   c. Depletion layer will remain unchanged
   d. None of the mentioned

2. Ripple factor of a half wave rectifier is
   a. 1.21
   b. 0.08
   c. 0.61
   d. 2.14

3. What is the voltage required across the P-N junction, to make it conduct in forward bias state for a silicon diode?
   a. 0.3 V
   b. 0.9 V
   c. 0.7 V
   d. 1.2 V

4. What is the magnitude of the current in forward biased state?
   a. Zero
   b. Depends on reverse voltage
   c. Depends on forward voltage
   d. Depends on temperature

5. The doped region in a transistor are _____
   a. Emitter and Collector
   b. Emitter and Base
   c. Collector and Base
   d. Emitter, Collector and Base

6. Which junction is forward biased when transistor is used as an amplifier?
   a. Emitter-Base
   b. Emitter-Collector
   c. Collector-Base
   d. No junction is forward biased

7. In a transistor configuration α parameter is
   a. I_C/I_E
   b. I_E/I_C
   c. I_C/I_B
   d. I_B/I_E

8. How will be the output voltage obtained for an ideal op-amp?
   a. Amplifies the difference between the two input voltages
   b. Amplifies individual voltages input voltages
   c. Amplifies products of two input voltage
   d. None of the mentioned

9. Which factor determine the output voltage of an op-amp?
   a. Positive saturation
   b. Negative saturation
   c. Both positive and negative saturation voltage
   d. None of the mentioned

10. Which of these is incorrect for an operational amplifier?
   a. It has a high voltage gain
   b. It is a direct coupled amplifier
   c. It is only useful for amplifying AC signals
   d. It was originally designed to perform mathematical operations

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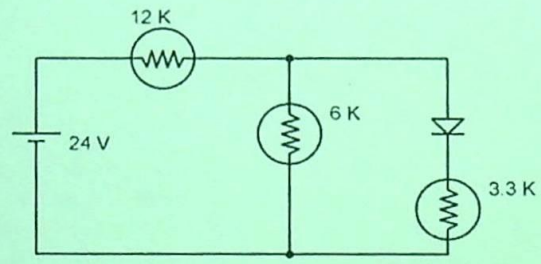
Descriptive

Time : 1 hr. 15 mins. **Marks : 25**

[Answer question no.1 & any two (2) from the rest]

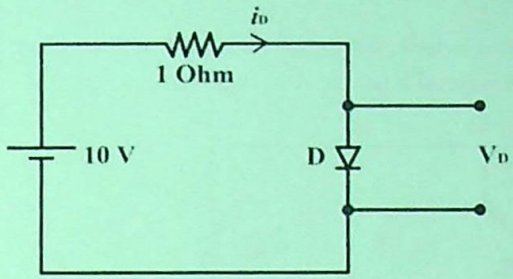
1. 5

In the following circuit, the voltage drop across the diode in forward bias is 0.7 V. Calculate the current through the diode.



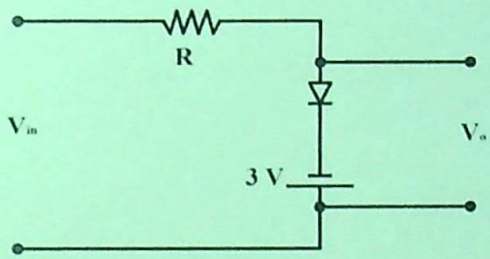
2. **a.** A diode D as shown in the circuit has an i-v relation given by: **5+5=10**

$$i_D = \begin{cases} V_D^2 + 2V_D, & for\ V_D > 0 \\ 0 & , for\ V_d \leq 0 \end{cases}$$



What is the value of V_D?

b. If $V_{in} = 10 \sin \omega t$ (in volts), draw the output waveform and transfer characteristics curve for the following circuit.



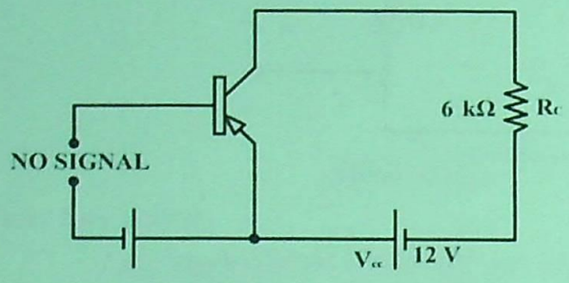
3. **a.** Draw the circuit diagram for common base and common emitter transistor configurations. Define current amplification factor in each case and explain the concept of leakage currents in both. **6+2+2 =10**

b. In a CB connection, current amplification factor is 0.9. If the emitter current is 1 mA, determine the base current.

c. A transistor is connected in CE mode. Collector supply is 8 V and voltage drop across R_C is 0.5 V. If α=0.96, R_C=800 Ω. Calculate the collector-emitter voltage and base current.

4. **a.** Explain the concept of dc load line analysis in a CE transistor. What is operating point? Locate the operating point in the dc load line. **6+4=10**

b. In the circuit shown below, draw the dc load line. What will be the Q-point if zero signal base current is 20 μA and β=50?



5. **a.** Draw the circuit diagram and calculate the voltage gain in inverting and non-inverting amplifier. **6+4=10**

b. Design an adder circuit using an inverting Op-Amp. Take four voltages i.e. V_1, V_2, V_3 and V_4 as inputs.

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