

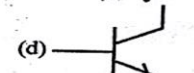
Unit: 9. SC Devices & their applications (30 marks)

1 mark → 3 Questions 5 mark → 1 Question 61

3 mark → 2 Questions 46,47,48,49 10 mark → 1 Question 69

UNIT – 9. Semiconductor Devices & their Applications – 1 mark Questions

- The potential barrier of silicon PN junction diode is approximately [J-06]
a) 0.3 V **b) 0.7 V** c) 1.1 V d) 10 V
- The forbidden energy gap for silicon is of the order of ----
a) 0.7 eV b) 0.4 eV
c) 1.1 eV d) 10 eV [O-06,M-10,09,O-10]
- The forbidden gap energy for Ge is of the order of ---
a) 1.1 eV **b) 0.7 eV** c) 0.3 eV d) 10 eV [M-06]
- The forbidden energy gap for conductors is ---
a) 0.7 eV b) 1.1 eV **c) zero** d) 3 eV [M-10]
- An example of n-type semiconductor is -----[dmp]
a) pure Ge b) pure Si
c) Si doped P d) Ge doped with B
- In an N-type semiconductor donor level lies --- [S-12]
a) just below the conduction band
b) just above the conduction band c) just below the valence band
d) just above the valence band
- In the forward characteristic curve, a diode appears as ----
a) a high resistance b) a capacitor
c) an OFF switch **d) an ON switch** [J-11,13,S-12]
- The color of light emitted by LED depends on ----
a) its reverse bias b) amount of forward current
c) its forward bias **d) type of semiconductor** [J-06,S-08]
- Which of the following are donor atoms?
a) Silicon & Germanium **b) Al & Ga**
c) Bi & Arsenic d) Boron & Indium
- Avalanche breakdown is primarily dependent on the phenomenon of ---[S-07,m-12,J-12,M-11,12]
a) collision b) ionization
c) doping d) recombination
- In a transistor, the value of $(1/\alpha - 1/\beta)$ is equal to -----
a) α b) β c) β/α **d) 1** [M-11]
- In junction transistor the emitter region is heavily doped since emitter has to supply to the base ---
a) minority carriers **b) majority carriers**
c) acceptor ions d) donor ions [S-07]
- In a PN junction diode on the side of N but very close to the junction there are ---- [J-12]
a) donor atoms b) acceptor atoms
c) immovable positive ions d) immovable negative ions
- The symbol to represent LED is --- [J-07]



Answer: (c)

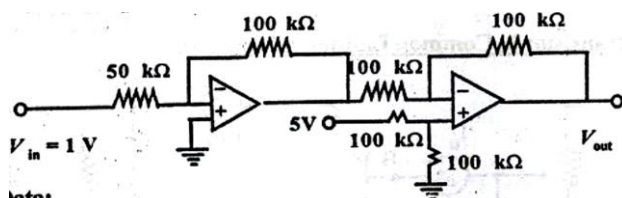
- In a Colpitt's oscillator circuit ----- [DMP,J-08]
a) capacitive feedback is used b) tapped coil is used
c) no tuned LC circuit is used d) no capacitor
- Barkhausen condition for maintenance of oscillation is [M-06,07,09]
 $\beta = 1/A$ b) $A\beta = \infty$ c) $A = \beta$ d) $A\beta = 1/\sqrt{2}$
- An oscillator is --- [M-08,J-09,J-10,O-10]
a) An amplifier with feedback b) a converter of AC to DC
c) nothing but an amplifier d) an amplifier without feedback
- The condition for an oscillator is ----- [M-06]
a) $A\beta = 0$ b) **$A = 1/\beta$** c) $A\beta = \alpha$ d) $A+\beta = 0$
- An example for non-sinusoidal oscillator is ----- [M-09]
a) multivibrator b) RC oscillator
c) Colpitts oscillator d) Crystal oscillator
- In common emitter amplifiers, the phase reversal between input and output voltages is ---
a) 0° b) 90° c) 270° **d) 180°** [J-08]
- The phase reversal between the input and the output voltages in single phase CE amplifier is ----
a) $\pi/2$ b) 2π **c) π** d) $3\pi/2$ [O-11]
- The reverse saturation current in PN junction diode is only due to -

a) minority carriers b) majority carriers
c) acceptor ions d) donor ions [J-09,O-11]
- For a transistor connected in common emitter mode[CE] the slope of the input characteristic curve gives : [M-13]
a) input impedance b) current gain
c) reciprocal of input impedance d) voltage gain
- Which of the following devices has a source of emf inside it?
a) Voltmeter b) Ammeter
c) Ohm-meter d) Rectifier [M-13]
- In the pin configuration of IC 741, pin 3 represents -----
a) inverting input **b) non-inverting input**
c) $-V_{cc}$ d) output [[M-10]
- A logic gate which has an output '1' when the inputs are complement to each other is -
a) AND b) NAND
c) NOR **d) EXOR** [S-07]
- A logic gate for which there is 'Low' output only when both the inputs are 'High' is ---- [J-07]
a) AND **b) NAND** c) NOR d) EXOR
- A logic gate for which there is an output only when both the inputs are zero is ---- [J-11]
a) NAND **b) NOR** c) EXOR d) AND
- According to law of Boolean algebra, the expression $(A+AB)$ is equal to ----
a) A b) AB c) B d) \bar{A} [M-09,11]
- The Boolean expression for NAND gate operation is ----

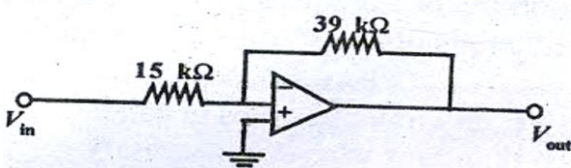
24. Draw the circuit diagram for an OR gate using diodes. [J-06]
25. Draw the circuit diagram of AND gate using diode and resistor. [J-07]
26. What are universal gates? Why are they called so? [J-12]
27. Draw NOT gate using transistor [J-10,O-11]
28. Give the important parameters of OPAMP? [S-07]
29. Draw the circuit for summing amplifier using operational Amplifier. [M-09,13,J-13]
30. Draw the circuit diagram for inverting amplifier using Op-Amp [M-11]
31. Draw the difference amplifier using Op-Amp [J-11]
32. Mention any three uses of cathode ray oscilloscope.[J-09]
33. Prove the Boolean identity $(A + B)(A + C) = A + BC$ [M-11,S-12]

CIRCUIT BASED PROBLEMS 3- marks

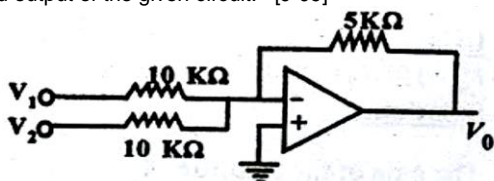
1. Find out the output of the amplifier circuit given below: [J-07]



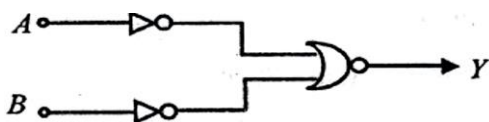
2. Find output of the ideal OPAMP shown in fig. for the input $V_{in} = 120$ mV direct current. [J-08,M-12]



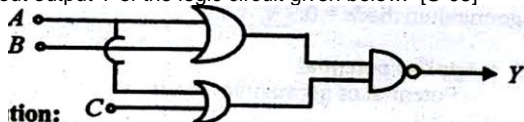
3. Find output of the given circuit: [J-09]



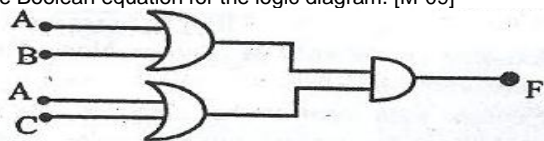
4. The outputs of two NOT gates are NORred as shown in fig, what is the logic operation performed? [S-07]



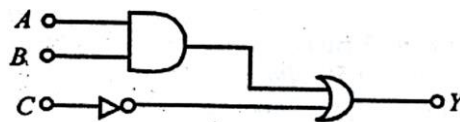
5. Find out output Y of the logic circuit given below: [S-08]



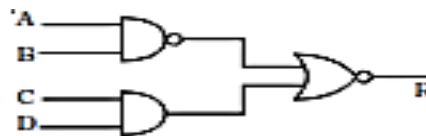
6. Give the Boolean equation for the logic diagram. [M-09]



7. What is the Boolean expression for the logic diagram shown in fig. Evaluate its output if $A = 1$, $B = 1$, and $C = 1$. [M-10]



8. Give the Boolean expression for the given logic diagram [J-11]



UNIT 9. Semiconductor Devices & their Applications 3 mark Problems

1. The gain of an amplifier is 100. 5% of the output voltage is feedback into the input through a negative feedback network, find out the voltage gain after feedback. [dmp]
2. When there is no feedback the gain of an amplifier is 100. If 5% of the output voltage is fed back into the input through a negative feedback network, find out the voltage gain after feedback. [M-07,S-11]
3. The gain of an amplifier without feedback is 100 and with positive feedback is 200, Calculate the feedback fraction. [M-06]
4. When the negative feedback is applied to an amplifier of gain 50, the gain falls to 25. Calculate the feedback ratio. [J-06,S-09, M-10,O-10]
5. The voltage gain of an amplifier without feedback is 100. If negative feedback is applied with feedback fraction $\beta = 0.1$, calculate the voltage gain after feedback. [O-06]
6. A transistor is connected in CE configuration. The voltage drop across the load resistance (R_L) $3 K\Omega$ is 6V. Find the base current. The current gain α of the transistor is 0.97. [M-08,J-10]
7. In a common base transistor circuit $I_c = 0.97$ mA and $I_b = 30 \mu A$. Calculate the value (α) the current gain. [J-13]
8. The base current of a transistor is $50 \mu A$ and collector current is 25 mA. Determine the values of β and α . [S-12,M-13]

UNIT - 9. Semiconductor Devices & their Applications - 5 mark Questions

1. Explain the working of a half wave diode rectifier[M-09,J-11,M-10,M-13]
2. Explain the working of bridge rectifier with neat diagram [S-09]
3. Explain the action of zener diode as a voltage regulator with necessary circuit. [S-12]
4. Define current amplification factors α and β and obtain the relation between them. [J-07]
5. Explain the function of transistor as a switch. [S-07]
6. With the help of circuit diagram, explain the voltage divider biasing of a transistor. [M-07,J-09]
7. Draw the frequency response curve of single stage CE amplifier and discuss the result. [DMP. M-08]
8. What is AND gate? Explain the function of AND gate using electrical circuit and using diodes. [J-08]
9. State and prove De-Morgan's theorem. [M-06,10,O-06,10,11,J-13]
10. Explain the circuit symbol and pin-out configuration of an operational amplifier. [S-08]

11. Explain how multimeter is used as ohm-meter (multimeter diagram not necessary) [M-11]
12. Explain the function of an operational amplifier as a summing amplifier. [J-12]

UNIT – 9. Semiconductor Devices & their Applications

10 mark Questions

1. What is rectification? Explain the working of bridge rectifier with necessary waveforms. [DMP,M-06,10,J-06,07,10,12,O-11]
2. Explain the output characteristics of NPN transistor connected in common emitter configuration with the help of a neat circuit diagram. [O-10]
3. Discuss the output characteristics of a transistor connected in CE mode with a neat diagram. [S-08,12]
4. Explain with a neat diagram, the working of a single stage CE amplifier. Draw the frequency response curve and discuss the results. [S-07,M-11,13/M-08-5m]
5. Explain with a neat diagram, the working of a single stage CE amplifier. [J-08]
6. Explain with a neat diagram, explain the function of a CE transistor amplifier. [S-08]
7. What is meant by feedback? Derive an expression for voltage gain of an amplifier with negative feedback. [M-09,J-13]
8. Sketch the circuit of Colpitts oscillator and explain its working. [J-06,O-06M-0J-0-9,J-11,M-12]
9. What is an amplifier? Explain its action as (1) inverting amplifier (2) non-inverting amplifier [S-09]
10. With circuit diagram, explain the working of an operational amplifier as a summing amplifier. [M-07]
11. Explain the working OPAMP as differential amplifier. [S-07]