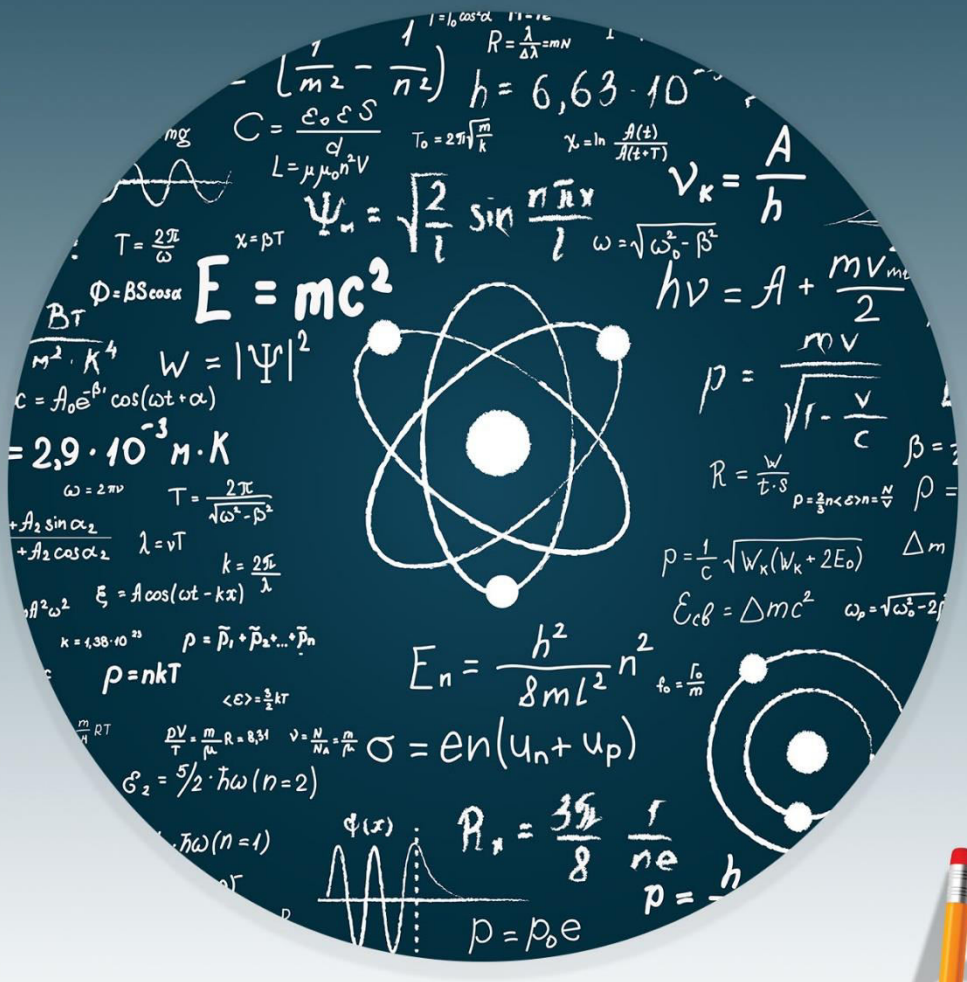
PHYSICS



WORKSHEET-5

STEP

A PROJECT BY PUNJAB GROUP

Worksheet-5

Topics:- Half and Full Wave Rectification, Operational Amplifier and its Characteristics

USE THIS SPACE FOR SCRATCH WORK

Q.1 A P-N junction diode is said to be forward biased when:

A) No potential difference is applied across P and N regions

B) A potential difference is applied across P and N regions making P region positive and N region negative

C) A potential difference is applied across P and N regions making P region negative and N region positive

D) A magnetic field is applied in the region of junction

Q.2 When a P-N junction is forward biased then width of depletion region.

A) Increases C) Remains unchanged

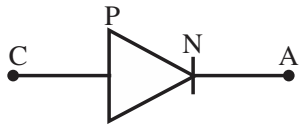
B) Decreases D) is variable

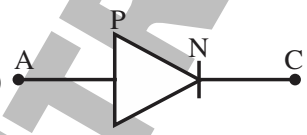
Q.3 Circuit used to convert pulsating D.C into pure D.C is called:

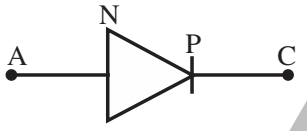
A) Rectifier C) Filter

B) Inverter D) Converter

Q.4 If "A" stands for anode and "C" stands for cathode, then which of following is a correct labeled symbolic diagram of a rectifier.

A) 

C) 

B) 

D) None of these

Q.5 When a diode is reverse biased, then its resistance is of the order of?

A) ohms C) mega ohms

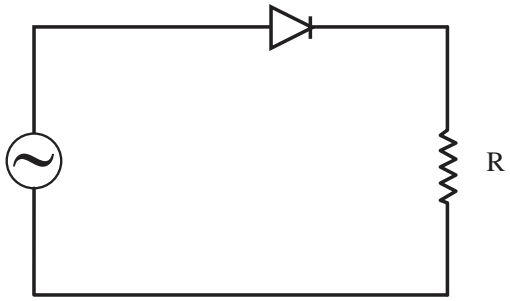
B) kilo ohms D) micro ohms

Q.6 The time period of output ripple of a full wave rectifier is 40 ms, what will be the input A.C frequency of this rectifier circuit?

A) 100 Hz C) 25 Hz

B) 50 Hz D) 12.5 Hz

Q.7 The potential drop across the diode in the following circuit during the conduction mode of diode is:

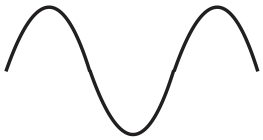


A)

B)

C)

D)



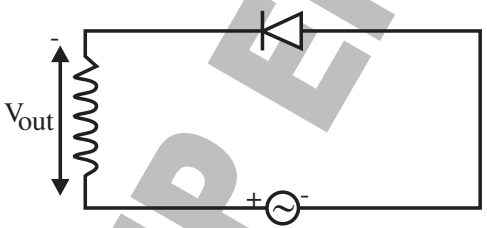
Q.8 Which of following is not true about half wave rectifier?

A) Output ripple has same time period as that of A.C input
B) It produces pure D.C at output
C) Diode conducts only for one half of A.C
D) During reverse Biased mode of rectifier, the output is zero

Q.9 The similar feature of half wave rectifier and full wave rectifier for same input A.C source is:

A) Both produces output ripples of same frequency
B) Both uses only forward biased mode of diode
C) Both uses a pair of diodes for operation
D) Both produces pulsating D.C output

Q.10 What can be the output of following half wave rectifier?



A)

B)

C)

D)

Q.11 For identical external resistors, which of the following will have more value of output voltage, when input

USE THIS SPACE FOR SCRATCH WORK

voltage is same;

A) Non-inverting Op-Amp C) Both have same output

B) Inverting Op-Amp D) None of these

Q.12 The number of input terminals of an ordinary op-amp are:

A) Two C) Four

B) Three D) Eight

Q.13 The magnitude of "Open loop gain" of an amplifier is of the order of:

A) $10^5\ \Omega$ C) 10^5 V

B) 10^5 A D) 10^5

Q.14 An op-amp can be used as a:

A) Inverting and non-inverting amplifier

B) Comparator

C) Night switch

D) All of the above

Q.15 The Closed loop Gain "G" of the non-inverting amplifier can be expressed by:

A) $G = \frac{-R_2}{R_1}$ C) $G = \frac{R_2}{R_1}$

B) $G = 1 + \frac{R_2}{R_1}$ D) $G = 1 - \frac{R_1}{R_2}$

Q.16 An op-amp will act as an inverting amplifier when the input signal is not connected to:

A) Non-inverting terminal C) Non-Inverting output

B) Inverting terminal D) Inverting output

Q.17 An op-amp will not act as a non-inverting amplifier when input signal is connected to the

A) Non-inverting input C) Non-Inverting output

B) Inverting input D) Inverting out put

Q.18 The gain of an inverting amplifier having external resistance R_1=50 kΩ and R_2=200 kΩ respectively will be

A) 4 C) -20

B) 20 D) -4

Q.19 What is gain of Op-Amp shown in figure:

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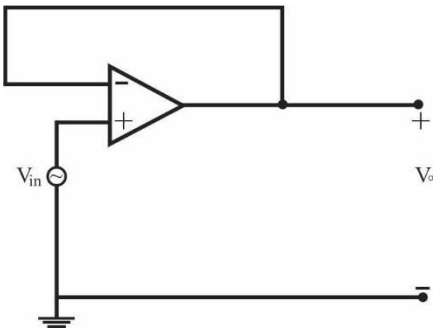
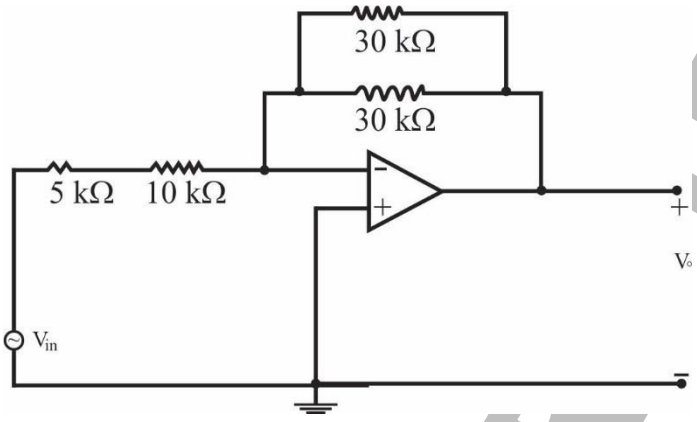


A) 0 C) ∞

B) 10^5 D) 1

Q.20 What is gain of Op-Amp shown in figure:

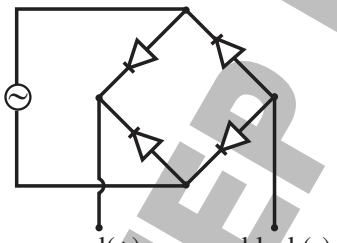


A) -3 C) -5

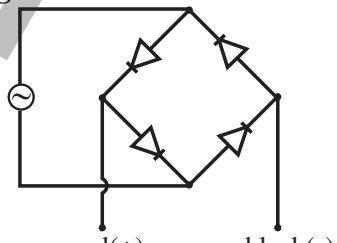
B) -2 D) None of these

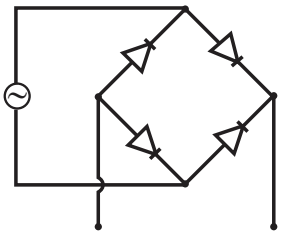
Q.21 Some students were given following instructions.
"Design a circuit to give a full wave rectifier output from an A.C supply. The positive output must be connected to a red terminal and negative output to a black terminal."
Which circuit satisfies the design instructions?

A)



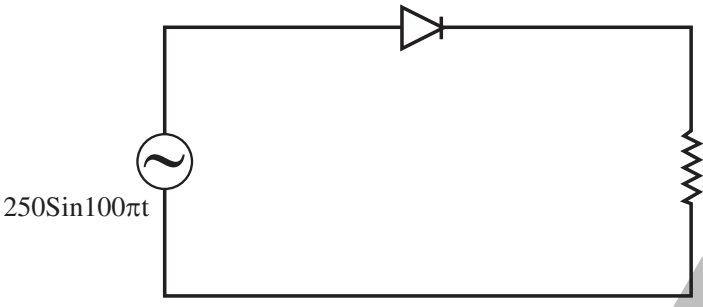
C)





B) D) None of these

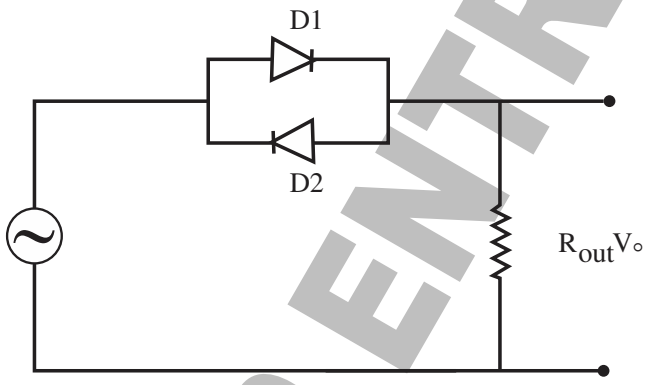
Q.22 The rms current flowing through the following circuit will be (where diode has negligible forward biased resistance):



A) $\frac{5}{2}A$ **C)** $\frac{5}{4}A$

B) $\frac{5}{3}A$ D) $\frac{5}{6}A$

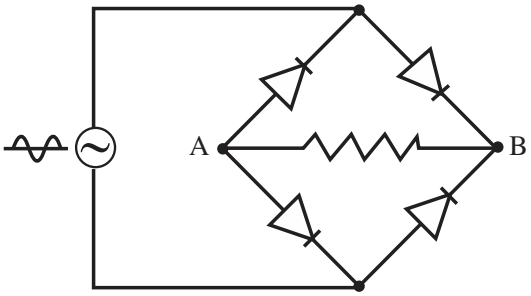
Q.23 If the diode D_1 is taken off from the circuit, the output across resistor will become?



A) Half wave rectified C) Zero

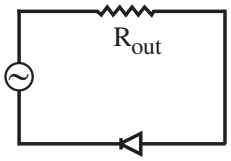
B) Full wave rectified D) A.C

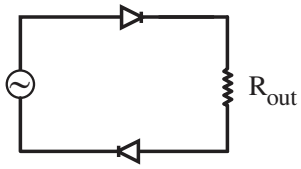
Q.24 The direction of current through the resistor in the circuit shown during negative half of A.C will be:

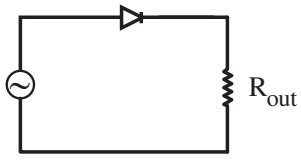


A) From A to B
B) From B to A
C) No current flows during negative half
D) Both A and B are possible

Q.25 If the source frequency is same in all cases, for which circuit out of the following the ripple frequency is more?

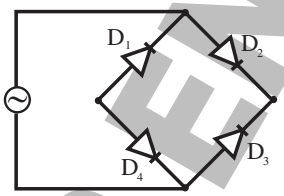
A)


B)


C)


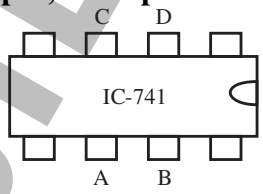
D) Ripple frequency will be same in all cases

Q.26 What change can be made to convert the following bridge into half wave rectifier?



A) Replace D_1 by a resistor C) Replace D_3 by a resistor
B) Replace D_2 by a resistor **D) All of these**

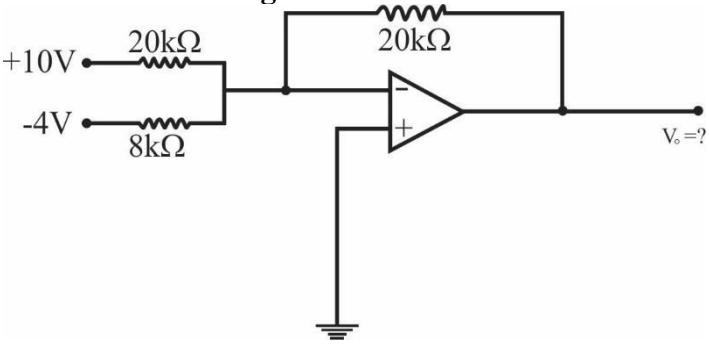
Q.27 An operational amplifier is shown in the diagram, to get an inverted output, the input must be applied at:



A) A C) C

B) B **D) D**

Q.28 The current through 8kΩ in the circuit shown is:



A) Zero C) +0.75A

B) -0.5mA D) None of these

ANSWER KEY (Worksheet-05)					
1	B	11	A	21	A
2	B	12	A	22	C
3	C	13	D	23	A
4	C	14	D	24	B
5	C	15	B	25	D
6	D	16	A	26	D
7	C	17	B	27	D
8	B	18	D	28	B
9	D	19	D		
10	A	20	D		

SOLUTIONS

Unit – 8 (WS-05)

Q.1 Answer is "B"

Solution:- A diode is said to be in forward biased mode if its P-side is connected with high potential and N-side is connected with low potential.

Q.2 Answer is "B"

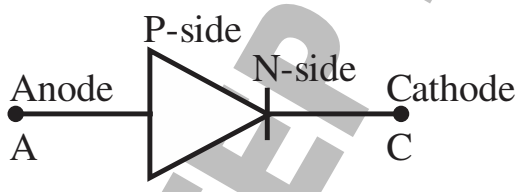
Solution:- During forward biased mode the resistance and width of potential barrier drops.

Q.3 Answer is "C"

Solution:- RC-filter is used to produce pure D.C by pulsating D.C.

Q.4 Answer is "C"

Solution:- Correct labeled diagram of rectifier is



Q.5 Answer is "C"

Solution:- Forward biased resistance is of the order of few ohms while reverse biased resistance is of the order of mega ohms.

Q.6 Answer is "D"

Solution:-

Step-I

For full-wave rectifier:

$$T_{A.C} = 2T_{ripple} = 80\ ms$$

Step-II

$$f_{A.C} = \frac{1}{T_{A.C}} = \frac{1}{80\times10^{-3}} = 12.5\ \text{Hz}$$

Q.7 Answer is "C"

Solution:- During forward biased mode the potential drop across is negligible.

Q.8 Answer is "B"

Solution:- Half wave rectifier have pulsating D.C at output.

Q.9 Answer is "D"

Solution:- Both rectifiers produces pulsating D.C at output.

Q.10 Answer is "A"

Solution:- This rectifier will conduct for negative half of A.C

Q.11 Answer is "A"

Solution:- For identical resistors

$$G_{non-inverting} = 1 + \frac{R_2}{R_1} = 1 + G_{inverting}$$

$$\therefore G_{inverting} = \frac{-R_2}{R_1}$$

-ve sign just shows

180° shift in output

Q.12 Answer is "A"

Solution:- Op-Amp has two input terminals and one output terminal.

Q.13 Answer is "D"

Solution:- Open loop gain is of the order of 10^5.

Q.14 Answer is "D"

Solution:- Op-Amp can be used for all mentioned operations

Q.15 Answer is "B"

Solution:- For non-inverting amplifier

$$G = 1 + \frac{R_2}{R_1}$$

Q.16 Answer is "A"

Solution:- Op-Amp acts as inverting amplifier when input is connected to inverting terminal.

Q.17 Answer is "B"

Solution:- Op-Amp acts as non-inverting amplifier when input is connected to non-inverting terminal.

Q.18 Answer is "D"

Solution:- $G = -\frac{R_2}{R_1}$

Q.19 Answer is "D"

Solution:- $G = 1 + \frac{R_2}{R_1}$

Q.20 Answer is "D"

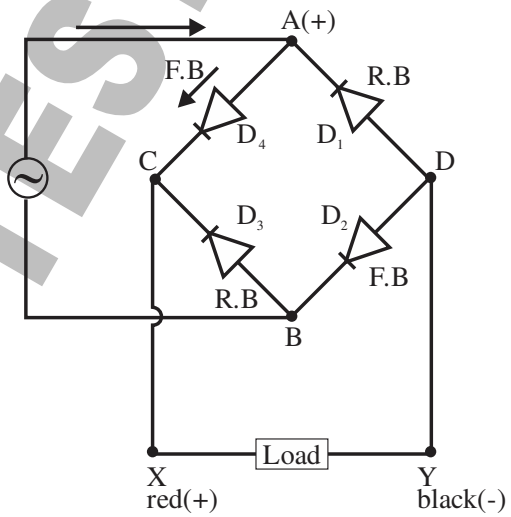
Solution:- $G = -\frac{R_2}{R_1}$

Q.21 Answer is "A"

Solution:-

Checking for option "A" during (0-T/2)

During this half D_2 and D_4 will be forward biased. When direction of current is traced, it is from X $\rightarrow$ Y on output side. Since conventional current flow from high to low potential, so X will be at +ve potential w.r.t Y. As labeled "X" is made red terminal so this satisfies the design conditions. Similarly check for negative half, same result will come, so "A" option is correct.



Q.22 Answer is "C"

Solution:-

Finding $I_\circ$

$$I_\circ = \frac{\varepsilon_\circ}{R} = \frac{250}{100} = \frac{5}{2}\ A$$

Finding I_{rms}

For half wave rectifier;

$$I_{rms} = \frac{I_\circ}{2} = \frac{\frac{5}{2}}{2} = \frac{5}{4}\ A$$

Q.23 Answer is "A"

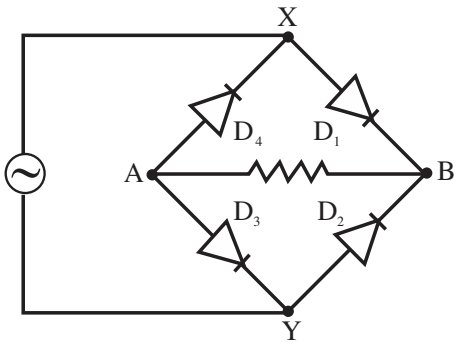
Solution:-

Taking D_1 off will result only one diode in circuit, so it will behave as half wave rectifier.

Q.24 Answer is "B"

Solution:-

During negative half, X will become -ve and Y will become +ve. Consequently, D_1 and D_3 will become reverse biased and D_2 & D_4 will become forward biased. The conventional current will flow from Y toward B and then from B towards A.



Q.25 Answer is "D"

Solution:-

All the given circuits are of half wave rectification, so ripple frequency will be same for all.

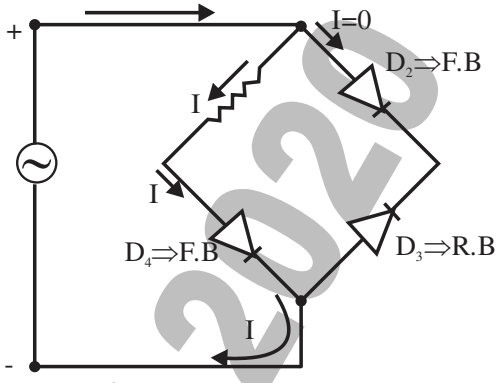
Q.26 Answer is "D"

Solution:-

When anyone out of four diodes is replaced by resistor, the circuit behaves as half wave rectifier. For example, if D_1 is replaced by resistor the circuit for both halves of A.C will be:

For +ve half

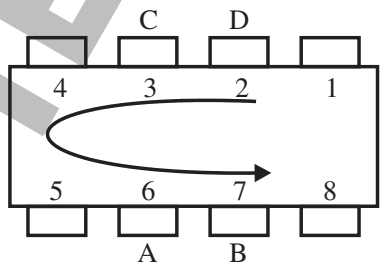
A positive pulse will be output across resistor during this half. Check for negative half, current won't flow as it will not find any close path.



Q.27 Answer is "D"

Solution:-

Op-Amp numbering is done from capsule side in anti-clockwise direction as following:



Pin "2" (D) & "3" (C) represent inverting and non-inverting inputs terminals.

- Pin "6" (A) represents output terminal.
- Pin "4" & "7" represent $\pm V_{cc}$.
- Pin "1" & "5" represent offset null terminals.
- Pin "8" represents NC terminal (not connected).

Q.28 Answer is "B"

Solution:-

By ohm's Law

$$I = \frac{\Delta V}{R} = \frac{-4 - V_-}{8k\Omega} \qquad (\because V_- \approx V_+ = 0)$$

$$I = \frac{-4-0}{8k\Omega} = -0.5mA$$

STEP

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