

APOLLO

Alternating Current

FBISE Physics Class 12 (HSSC-II)

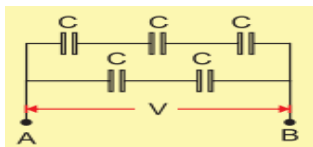
Domain E: Electricity and Magnetism

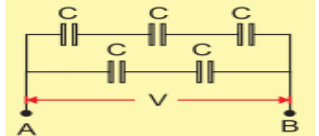
70 questions | questions

Original FBISE question crops. National Curriculum 2022-23 topic.

10.	Sinusoidal waveform is generated in AC system because:	it can be easily drawn	it produces least disturbance in electrical circuits	it is natural standard	other waves cannot be produced easily.	○)))
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Q. 2	Questions	Marks
(i)	Calculate the orbital speed of satellite orbiting the Earth at an altitude equal to Earth's radius.	03
(ii)	Explain how pressure is exerted by the movement of gas molecules?	03
(iii)	Write three examples of resonance from everyday life.	01+01 +01
(iv)	The fringe spacing between the central maxima and 1 st minima is 2 mm. If a light of 500 nm is used then find the separation between the slits. (The distance between the slit and screen is 1 m).	03
(v)	Define mutual inductance. Write its formula. Also define its unit.	01+01 +01

Q. 2	Questions	Marks	Questions	Mark
(i)	Calculate the orbital speed of satellite orbiting the Earth at an altitude equal to Earth's radius.	03	OR A body with mass 800 g attached to a spring, vibrates with amplitude 30 cm. The restoring force is 60 N when the displacement is 0.30 m. Find out its (a) angular frequency (b) velocity and acceleration at $x = 12$ cm.	1.5 +1.5
(ii)	Explain how pressure is exerted by the movement of gas molecules?	03	OR Write any three conditions for observing interference fringes?	01+01 +01
(iii)	Write three examples of resonance from everyday life.	01+01 +01	OR List three uses of capacitors in household appliances.	01+01 +01
(iv)	The fringe spacing between the central maxima and 1 st minima is 2 mm. If a light of 500 nm is used then find the separation between the slits. (The distance between the slit and screen is 1 m).	03	OR A network of five capacitors, each of capacitance C is connected to a 100 V supply, as shown in below figure. Determine the equivalent capacitance of the network. 	03
(v)	Define mutual inductance. Write its formula. Also define its unit.	01+01 +01	OR Define gravitational field strength. Also write its formula and define its unit.	01+01 +01
(vi)	When electrons are accelerated through a potential difference of 10^5 volts in an X-ray tube.	03	OR AC voltage across a $0.5 \mu\text{F}$ capacitor is $16\sin(2 \times 10^3 t)$ V. Find its capacitive reactance.	03

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(v)	Define mutual inductance. Write its formula. Also define its unit.	01+01 +01	OR Define gravitational field strength. Also write its formula and define its unit.	01+01 +01
(vi)	When electrons are accelerated through a potential difference of 10^5 volts in an X-ray tube. Calculate the minimum wavelength produced.	03	OR AC voltage across a $0.5 \mu\text{F}$ capacitor is $16\sin(2 \times 10^3 t)$ V. Find its capacitive reactance.	03
(vii)	Define (a) cryosphere (b) lithosphere.	1.5 +1.5	OR Give three uses of X-rays.	01+01 +01
(viii)	What are the conditions required for pair production to occur?	03	OR What is climate inertia? Give an example of climate inertia in the Earth's climate system.	01+01 +01
(ix)	What is the application of piezo-electric effect in medical science? Briefly explain	03	OR Explain how electron microscopes achieve very high resolution?	03
(x)	Why is the binding energy per nucleon higher in nuclear fusion	03	OR Explain the role of a single capacitor in output of full wave rectifier circuit.	03

Q.5	What is rectification? Explain the operation of a bridge rectifier as full wave rectifier.	01+ 05
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Differentiate 'statically induced emf' and 'dynamically induced emf'. Illustrate your answer with example.	03
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(v)	How can a galvanometer be converted into ammeter? Draw diagram as well.	2+1
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(vi)	What are the causes of power losses in Transformer? Write any three.	03
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a). Stress b). Strain c). Young's modulus for Steel (1)		
A pure inductor is connected across a 10V, 200Hz AC Supply and the current flowing through it is measured as 0.4A . Determine the value of its inductance.	03	
In which combination of capacitors the energy stored		

(xiii)	In RL series circuit, will the current Lag or Lead the voltage? Illustrate your answer by drawing waveforms and phasor diagrams.	1+2
(xiv)	Deduce the expression for maximum output power	

	Write any three factors affecting the magnitude of the induced emf.	03
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What is AC generator? How is an AC generator used to produce an alternating current? Explain with the help of graph between instantaneous emf and time.	2+3 +2
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Q.4	Construct phasor diagrams and impedance diagrams of an R-L-C series circuit. Determine formula for impedance, phase angle and power factor.	2+5
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What is rectification? Describe the use of diodes for half and full wave rectification with circuit diagrams.	2+2 +2
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(iii)	Write impedance equation for RLC Series circuit. What can be stated about impedance and current in a circuit at resonance condition?	03
(iv)	With higher frequency light emit a higher number of	

OR	Briefly describe a circuit which will give continuously varying potential.	03
	Write any three results of special theory of relativity	

(ix)	The value in Amperes of an alternating current is given by an equation $I=2\sin(50\pi t)$. What is the peak value of current? What is the frequency(f) of AC supply?	03
(x)	If a person swallows an α -particle and a β -particle	

(vii)	What is self-inductance? Write its SI unit. Enlist two factors affecting the inductance of a coil.	03
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OR	In an RC-Circuit, will the current lag or lead the voltage? Illustrate by drawing waveform and phasor diagram.	03
	Differentiate between conductors and semi	

Calculate the voltage ϵ_2 in the circuit by using Kirchoff's Voltage Law (KVL) when $I=0.2A$.		03
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OR	If a transformer is connected to a steady (DC) supply, no emf is induced across the secondary coil. Why?	03
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OR	A coil having a resistance of 7Ω and an inductance of $31.8mH$ is connected to $220V$, $50Hz$ AC supply. Calculate: a) The circuit current b) Phase angle c) Power factor	06
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Q.5	What is meant by motional emf? Compute emf across the ends of a conductor of length L that moves at a steady speed of ' v ' at right angle to a uniform magnetic field.	1+5
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6.	Which physical law relates current through a conductor to voltage and resistance?	Ampere's law	Faraday's law	Kirchhoff's law	Ohm's law
	The force on a current carrying conductor				

According to Faraday's law, the induced emf is proportional to the:	Rate of change of magnetic flux	Inverse of magnetic flux	Square of magnetic flux	Magnetic flux
In an AC circuit, the voltage and current are				

In an AC circuit, the voltage and current are out of phase by 90° when the circuit is purely:	Inductive	Conductive	Resistive	Capacitive
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15. Conversion of A.C into D.C is called:	Oscillation	Rectification	Modulation	Amplification
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(ii)	State Faraday's law of electromagnetic induction and give one practical application.	2+1	OR
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A 60V resistor is connected across A.C supply of 220V. Calculate the current drawn from the supply and the power consumed by the heating element. Briefly explain the working of potentiometer with circuit.

How are eddy currents produced? Explain briefly.	03
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(viii)	Differentiate between self-induction and mutual induction. Draw also their circuit diagrams.	1.5 +	OR	Differentiate between nuclear fission and nuclear fusion reactions with examples.	1.5 +
(ix)	Distinguish between soft and hard ferromagnetic	1.5		What is meant by 'Conductance' and 'Conductivity' of	1.5

Briefly explain the construction and working of a transformer.	1.5 1+2
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(x)	What is meant by rectification? Draw circuit diagram of a half wave rectifier using diode.	1.5 1+2	OR
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1+1	OR	What is meant by impedance? Draw phasor diagram of RL series circuit.	1+2
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Q.4	Explain with derivation the behaviour of a pure inductive AC circuit and draw its phasor diagram.	5+2	OR
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Q.5	Describe a PN junction and discuss its forward and reverse biasing with diagrams.	2+2+ 2	OR	Explain the implication of mass increase, time dilation and length contraction for space travel.	2+2 +2
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First Annual 2026 | Section B Q2(iii) OR | 3 marks

	for both in terms of path difference.	03
	Explain the function of capacitor in bridge rectifier circuit.	

First Annual 2026 | Section B Q2(iv) | 3 marks

	resonance.	
	What is self-inductance? Also write its SI unit and the factors upon which it depends.	1+2

First Annual 2026 | Section B Q2(ix) OR | 3 marks

1.5 +	OR	Draw labelled wave form and phasor diagram between applied voltage and current for pure inductor A.C.	
1.5		To which idea does a red shift exhibited by a star	

First Annual 2026 | Section B Q2(v) OR | 3 marks

	surface of Earth.	
	How does doubling the frequency affect the capacitive reactance? Show mathematically.	03

First Annual 2026 | Section B Q2(xiii) OR | 3 marks

	time graph.	
OR	Distinguish graphically between half-wave and full-wave rectification.	1.5+ 1.5

First Annual 2026 | Section C Q5 | 6 marks

	expression for fringe spacing.	
	In an RL series circuit, will the current lag or lead the applied alternating voltage? Explain the answer with phasor diagram. Also find an expression for the impedance of RL series circuit.	2+2 +2

First Annual 2026 | Section B Q2(iv) | 3 marks

	turning of radio station.	
(iv)	What is mutual inductance? Also write its SI unit and the factors upon which it depends.	1+2

First Annual 2026 | Section B Q2(ix) OR | 3 marks

	than optical microscope. (Compare both)	
OR	An AC circuit consists of pure resistance of $20\ \Omega$ and is connected across AC supply of 220V, 50Hz. Calculate: a. Peak value of voltage. b. Peak value of current.	

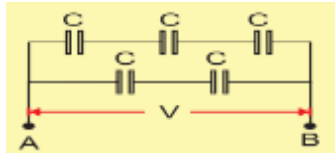
First Annual 2026 | Section B Q2(xiii) OR | 3 marks

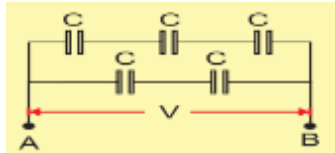
	examples.	
OR	Distinguish between peak value and root mean square (rms) values of alternating voltage.	1.5 +
	Deduce the equivalent	1.5

Q.5	Explain the working of a bridge rectifier using four diodes. Also draw the circuit diagram.	4+2	OR	What is photoelectric effect? Explain work function of metal and Einstein photo electric equation. What is the effect of frequency of radiation on K.E of photoelectrons?	1+3+2
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9.	In a full wave bridge rectifier, how many diode(s) conduct during each half cycle of AC input?	1	2	3	4
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(ii)	Explain how pressure is exerted by the movement of gas molecules?	03
(iii)	Write three examples of resonance from everyday life.	03
(iv)	The fringe spacing between the central maxima and 1 st minima is 2 mm. If a light of 500 nm is used then find the separation between the slits. The distance between the slit and screen is 1 m.	03
(v)	Define mutual inductance. Also write its unit.	03

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(ii)	Explain how pressure is exerted by the movement of gas molecules?	03	OR Write any three conditions for observing interference fringes?	03
(iii)	Write three examples of resonance from everyday life.	03	OR List the use of capacitors in various household appliances.	03
(iv)	The fringe spacing between the central maxima and 1 st minima is 2 mm. If a light of 500 nm is used then find the separation between the slits. The distance between the slit and screen is 1 m.	03	OR A network of five capacitors of capacitance C is connected to a 100 V supply, as shown in below figure. Determine the equivalent capacitance of the network. 	03
(v)	Define mutual inductance. Also write its unit.	03	OR Define gravitational field strength. Also write its formula and unit.	03
(vi)	When electrons are accelerated through a potential difference of 10^5 volts in an X-ray tube. Calculate the	03	OR A.C voltage across a $0.5 \mu\text{F}$ capacitor is $16\sin(2 \times 10^3 t)$ V. Find the capacitive reactance.	03

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(vii)	Define (a) cryosphere (b) lithosphere.	03	OR What is the main purpose of X-rays?	03
(viii)	What are the conditions required for pair production to occur?	03	OR What is climate inertia?	03
(ix)	What is the application of piezo-electric effect in medical science?	03	OR Explain how electron microscopes achieve very high resolution?	03
(x)	Sketch the variation of binding energy per nucleon with nucleon number.	03	OR Explain the role of a single capacitor in output of full wave rectifier circuit.	03
(xi)	Explain briefly that how global climate is determined by energy transfer from the Sun?	03	OR What is Stefan-Boltzmann law? Explain briefly.	03
(xii)	Explain why g is approximately constant for small changes in height near the earth's surface.	03	OR Describe the function of the control rods in reactor.	03
(xiii)	How pressure is related to average translational kinetic energy of a gas?	03	OR Describe the practical examples of free and forced oscillations.	03
(xiv)	What is diffraction grating?	03	OR Distinguish between root-mean-square (r.m.s.) and peak values for a sinusoidal alternating current.	03

Q.5	What is rectification? Explain the operation of a bridge rectifier, with the help of a diagram.	01+ 06
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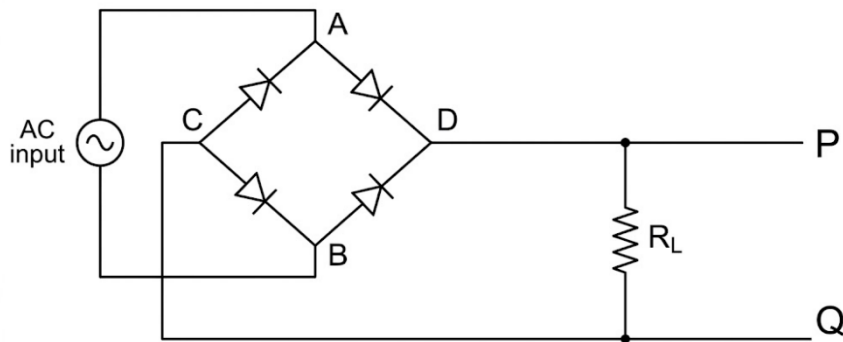
Calculate the mean value of g . (01)

How do we magnetize steel ball in this experiment? (01)

How does air resistance affect the result? (01)

A circuit shows a bridge rectifier connected to an AC supply. The terminals P and Q are connected to CRO circuit.

Q.5 A circuit shows a bridge rectifier connected to an AC supply. The terminals P and Q are connected to CRO circuit.



i. Draw the shape of input and output waveform displayed on CRO. (02)

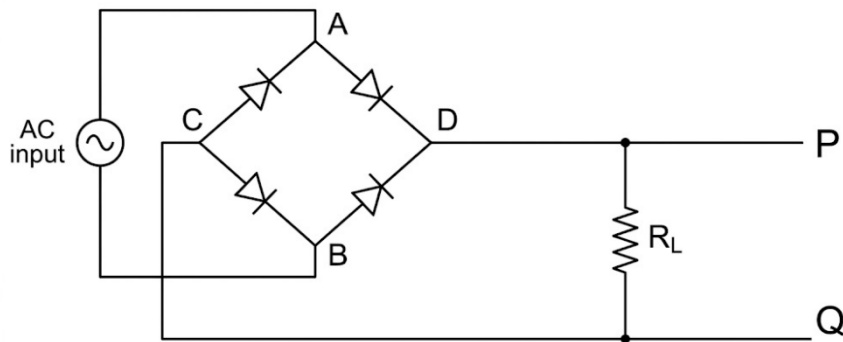
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i. Draw the shape of input and output waveform displayed on CRO. (02)

ii. At output PQ (from CRO) peak value of voltage ' V_o ' is 8V. What is its V_{rms} value? (01)

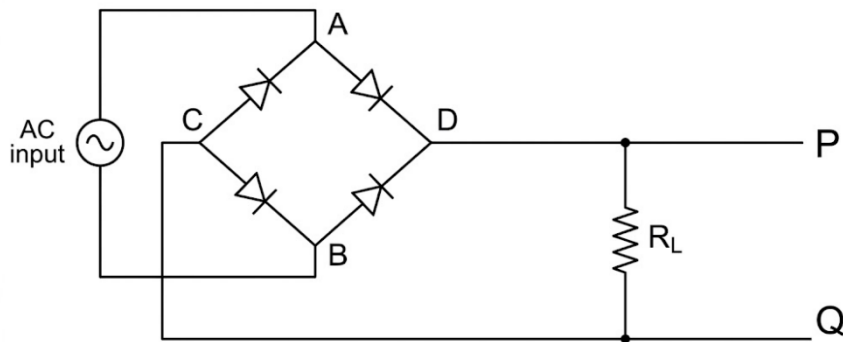
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- Draw the shape of input and output waveform displayed on CRO. (02)
- At output PQ (from CRO) peak value of voltage ' V_o ' is 8V. What is its V_{rms} value? (01)
- What is the ripple frequency of a full-wave rectifier compared to the input AC supply? (01)

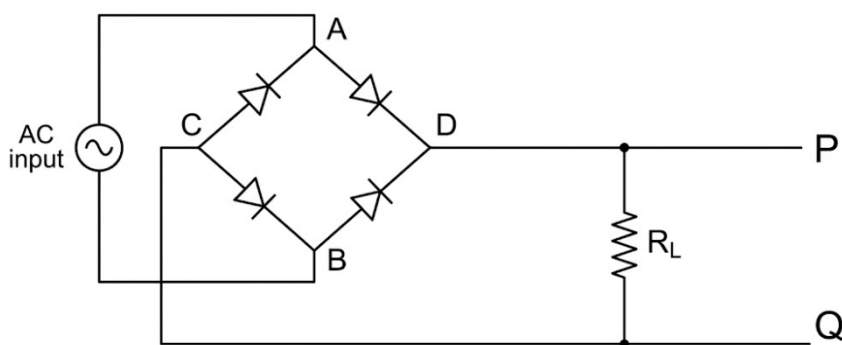
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- If the mains input time period is 0.02 s, what is the time period of output waveform after full-wave rectification? (01)

First Annual 2026 | Section B Q2(vii) | 3 marks

(vii)	State the factors which affect the inductance of a coil.	1+1 +1	OR	Find the relation of cyclotron frequency of charged particle in uniform magnetic field.	0
(viii)	How Geiger-Müller counter detects and counts?			Briefly explain the principle of metal detector with	1

First Annual 2026 | Section B Q2(x) | 3 marks

(x)	Briefly explain impedance in RLC series circuit of AC.	03	OR	How can one increase the capacitance of a capacitor?	0
(xi)	Differentiate between conductors and insulators in	1.5		Differentiate between emf and potential difference.	1

First Annual 2026 | Section B Q2(xiii) OR | 3 marks

OR	How does doubling the frequency affect the reactance of an inductor and a capacitor?	
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First Annual 2026 | Section C Q4 OR | 7 marks

OR	A 220V, 50Hz A.C. supply is applied to series combination of a 2.5Ω resistor, 6mH inductor and a $6.5\mu\text{F}$ capacitor. Calculate (i) reactance of inductor (ii) reactance of capacitor (iii) impedance of circuit (iv) current in the circuit	
	What is meant by 'half-life' of a radio active element?	

OR	Explain the phenomes of self-inductance of a coil. What is its unit? On what factors it depends?
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- (7) A steady current is passing through a coil, magnitude of self- induced emf in it, will be:
- A. zero ☐ B. maximum ☐
 C. $\varepsilon = L \frac{\Delta I}{\Delta t}$ ☐ D. $\varepsilon = -L \frac{\Delta I}{\Delta t}$ ☐
- (8) At high frequency in a capacitive circuit, the current will be:
- A. Large ☐ B. Small ☐
 C. Zero ☐ D. Infinite ☐
- (9) The peak value of A.C source is 20 A, its rms value will be:
- A. 14.1 A ☐ B. 10 A ☐
 C. 20 A ☐ D. 28.2 A ☐
- (10) The materials in which disordered structure of liquid is frozen are:
- A. Amorphous ☐ B. Crystalline ☐
 C. Polycrystalline ☐ D. Quartz ☐
- (11) The temperature below which the resistivity of a superconductor falls to zero is called:
- A. Absolute temperature ☐ B. Kelvin temperature ☐
 C. Limiting temperature ☐ D. Critical temperature ☐
- (12) In a half wave rectifier, the diode conducts:
- A. Only positive half of input cycle ☐
 B. Only negative half of input cycle ☐
 C. Both halves of input cycle ☐
 D. Any one half of input cycle ☐
- (13) The maximum kinetic energy of emitted photoelectrons, from different metal surfaces, depends upon:
- A. Intensity of incident light only ☐
 B. Frequency of the incident light only ☐
 C. Nature of metal surface ☐
 D. Both frequency of incident light and nature of metal surface ☐
- (14) The rest mass of photon is:
- A. Infinite ☐ B. Zero ☐
 C. 1.6×10^{-27} kg ☐ D. 3×10^8 kg ☐
- (15) The type of spectra produced by atoms is:
- A. Continuous spectra ☐ B. Band spectra ☐
 C. Line spectra ☐ D. Braking radiation spectra ☐
- (16) Strong nuclear force exists between:
- A. Hadrons ☐ B. Photons ☐
 B. Leptons ☐ D. Muons ☐
- (17) The half-life of a radioactive element which has only $\frac{1}{32}$ of its original mass left

- (8) At high frequency in a capacitive circuit, the current will be:
- | | | | | |
|----|-------|-----------------------|----|----------|
| A. | Large | ☐ | B. | Small |
| C. | Zero | ☐ | D. | Infinite |

- (9) The peak value of A.C source is 20 A, its rms value will be:
- | | | | | |
|----|--------|-----------------------|----|--------|
| A. | 14.1 A | ☐ | B. | 10 A |
| C. | 20 A | ☐ | D. | 28.2 A |

- (12) In a half wave rectifier, the diode conducts:
- | | |
|----|-----------------------------------|
| A. | Only positive half of input cycle |
| B. | Only negative half of input cycle |
| C. | Both halves of input cycle |
| D. | Any one half of input cycle |

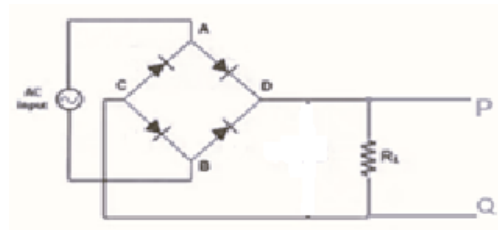
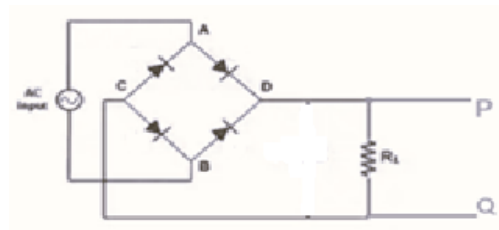
- v. Define the mutual-inductance of two coils. Write its formula. Also define its SI unit.

- vii. What is power dissipation value in capacitor and inductor in AC circuits? Elaborate your answer

OR

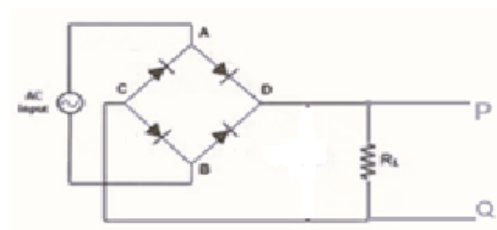
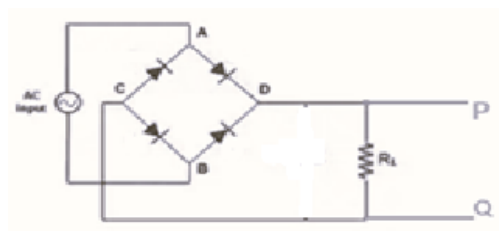
A 220V, 50Hz A.C. supply is applied to series combination of a 2.5Ω , 6mH inductor and a $6.5\mu\text{F}$ capacitor. Calculate (i) reactance of inductor (ii) reactance of capacitor (iii) impedance of circuit.

Q.5. A circuit shows a rectifier bridge connected to an AC supply. The terminals P and Q are connected to CRO circuit.



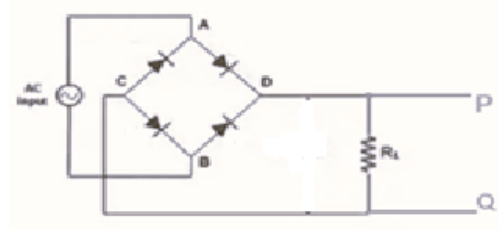
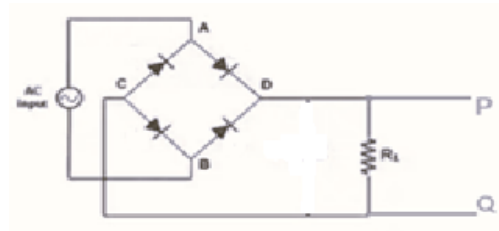
- i. Draw the waveform obtained at output PQ. (01)

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- i. Draw the waveform obtained at output PQ. (01)
 ii. At output PQ (from CRO) peak value of voltage 'V' is 8V. What is its r.m.s value? (02)

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- i. Draw the waveform obtained at output PQ. (01)
- ii. At output PQ (from CRO) peak value of voltage 'V' is 8V. What is its r.m.s value? (02)
- iii. Calculate the power dissipated in resistor if resistance 'R' is 4Ω . (01)