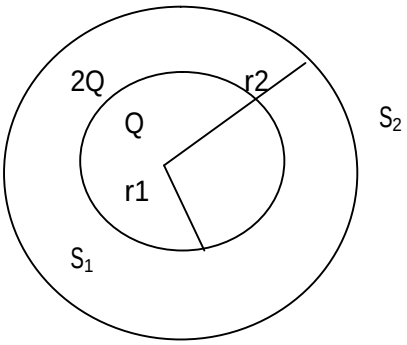
THE ASIAN SCHOOL, DEHRADUN

TEST PAPERS SESSION 2016-17

CLASS 12 SUBJECT Physics CHAPTER- 1 Electric Charges & Fields MM-32

Q1.	Write down the basic properties of charges?	1
Q2.	Write coulomb's law in vector from ?	1
Q3.	Define electric field and its physical significance.	2
Q4.	Define electric flux and its SI Unit.	2
Q5.	State electric dipole and its physical significance?	2
Q6.	State Gauss theorem in electrostatic.	2
Q7.	Derive an expression for the torque acting on the electric dipole when held in a uniform electric field.	2
Q8.	Derive and expression for electric field at a point on axial line of a dipole.	3
Q9.	Use Gauss's Law to derive the expression for the electric field intensity at a point, due to an infenite plane sheet with unform charge density σ , is independent of the distance of the field point.	3
Q10.	Prove that the electric field inside a uniformly charged spherical shell is zero.	3
Q11.	What does $q_1 + q_2 = 0$ signify in electrostatics.	1
Q12.	A uniformely charged conducting sphere of 2.4 m diameter has a surface charge density of $80\mu c/m^2$. i) Find the charge on the sphere. ii) What is the total electric flux leaving the surface of the sphere.	5
Q13.	S_1 and S_2 are the two concentric spheres enclosing charges Q and 2Q respectively as shown in a figure :  i) What is the ratio of the electir flux through S_1 and S_2. ii) How will the electric flux thourgh the sphere S_1 change if a medium of dielectric constant K is introduced in the space inside S_1 in place of air? iii) How will the electric flux through the spher S_1 change, if a medium of dielectric constnat K is introduce in the space S_2 in place of air.	5

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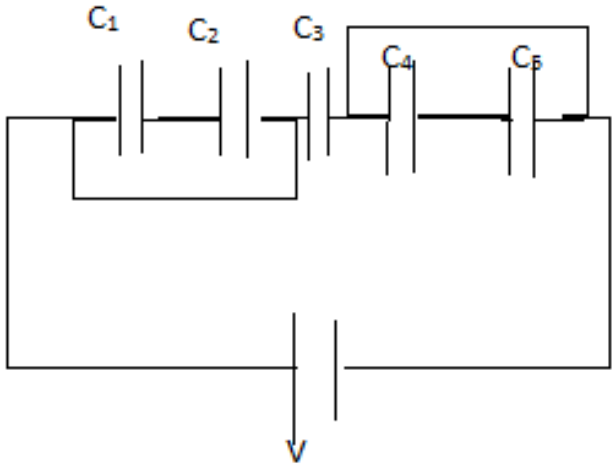
CLASS 12 SUBJECT Physics CHAPTER- 2 Electrostatic Potential and Capacitance MM-30

Q1.	The electric potential is constant in a given region. What can you say about the electric field these?	1
Q2.	What is the dielectric constant of a metal?	1
Q3.	In which orientation a dipole placed in a uniform electric field is in i) Stable ii) Unstable equilibrium?	2
Q4.	What is the equivalent capacitance C of the capacitors, connected as shown in figure? 	2
Q5.	Derive an expression for the capacitance of a parallel plate capacitor.	3
Q6.	Define : 'dielectric constant' of a medium. Briefly explain why the capacitance of a parallel plate capacitor increased on introducing a dielectric medium between the plates.	3
Q7.	Sketch equipotential surfaces for : i) A uniform electric field . ii) A negative point charge. iii) Two equal and opposite charges separated by a small distance.	3
Q8.	Using Gauss's Law show that electric field inside a conductor is zero.	2
Q9.	Derive an expression for the electric field at the surface of a charge condutor.	3
Q10.	Deduce an expression for the total energy stored in a parallel plate capacitor and related it to the electric field.	5
Q11.	Find the ratio of the poential differnces that must be applied across the parallel and the series conbination of two capacitors C_1 and C_2 with their capacitances in the ratio 1:3 so that the energy stored in two cases becomes the same.	5

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CLASS 12 SUBJECT Physics CHAPTER- 3 Current Electricity MM-30

Q1.	Define electrical conductivity of a material. And give its SI unit.	1
Q2.	Show on a graph, the variation of a resistivity with temperature for a typical semiconductor Si.	1
Q3.	Define the term of mobility of charge carriers in a conductor. Write its SI unit.	1
Q4.	Explain the 'drift velocity' of electrons in a conductor. Hence obtain the expression for the current through a conductor in terms of drift velocity.	2
Q5.	Define resistivity of a conductor. Plot a graph showing the variation of resistivity with temperature for a metallic conductor. How does one explain such a behaviour, using the mathematical expression for the resistivity.	2
Q6.	Distinguish between emf (ε) and terminal voltage (V) of a cell having internal resistance 'r'. Draw a plot showing the variation of terminal voltage (V) vs. the current (I) drawn from the cell. Using this plot, how does one determine the emf and the internal resistance of the cell?	2
Q7.	State the two Kirchhoff's rules used in electric network. How are these rules justified?	2
Q8.	State the working principles of a potentiometer. Explain with the help of a circuit diagram, how the emfs of two primary cells are compared by using a potentiometer. How can the sensitivity of a potentiometer be increase?	3
Q9.	State with the help of suitable diagram the principle on which the working of a meter bridge is based. Under what condition is the error in determining the unknown resistance minimize.	3
Q10.	Deduce the condition for balance in a Wheatstone bridge . Using the principle of Wheatstone bridge, describe the method of determine the specific resistance of a wire in the laboratory. Draw the circuit diagram and write the formula used. Write any two precoutions you would observe hile performing experiment.	3
Q11.	The length of a potentionmeter wire is 600 cm and it carries a 40mA current. For a cell of emf 2 volt and internal resistance 10 ohm, the null point is found at 500 cm. If a voltmeter is corrected across the cell, the balancing length of a wire is decreased by 10 cm. find (i) the resistance of the whole wire (ii) reading of voltmeter, (iii) resistance of voltmeter.	5
Q12.	A uniform wire is cut into 10 segments increasing in length in equal steps, the resistance of the shortest segment is R and the resistances of the other segments increase in steps of 8 ohm. If the resistance of the longest segments is 2R, find the value of R and hence find the resistance of a original wire.	5

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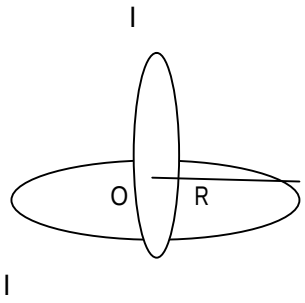
CLASS 12 SUBJECT Physics CHAPTER- 4 Magnetic Effect of Current MM-30

Q1.	Write down the expression for the Lorentz force on a charged particle.	1
Q2.	Write down the unit and dimension of μ_0.	1
Q3.	Write one of the two, an ammeter or a milliammeter, has a higher resistance and why?	1
Q4.	State Biot- Savart law and draw variation of magnetic field with distance from long wire carrying current I.	2
Q5.	Find expression of force per unit length acting between parallel current carrying wires at a distance 'd' from each other.	2
Q6.	Obtain an expression for torque acting on a rectangular current loop, when placed at an angle 'θ' with the direction of the magnetic field.	2
Q7.	Define current sensitivity and voltage sensitivity of a galvanometer.	2
Q8.	Define Ampere's circuital law? Find magnetic field due to long current carrying wire using Ampere's circuital law.	3
Q9.	Find magnetic field due to solenoid inside it?	3
Q10	Find magnetic field at the center 'o' in the figure.  	3
Q11.	Find expression of magnetic field due to current carrying circular wire at a point on the axis of circular wire.	5
Q12.	Describe qualitalively the path of a charged particle moving in : a) A uniform electrostatic field, with initial velecity i) Parallel to the field ii) Perpendicualr to the field b) A Uniform magnetic field, with initial velocity i) Parallel to the field. ii) Perpendicular to the field.	5

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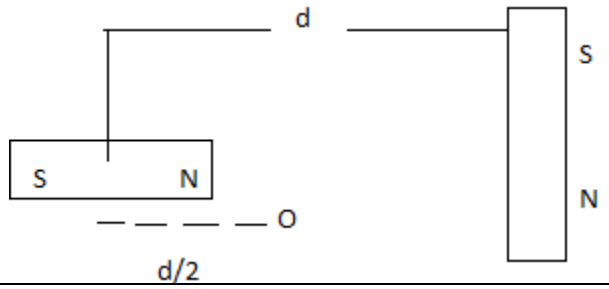
CLASS 12 SUBJECT Physics CHAPTER- 5 Magnetism MM-30

Q1.	What is the source of magnetic field?	1
Q2.	Write the SI unit of i) Pole strength and ii) magnetic moment of a bar magnet.	1
Q3.	In a uniform magnetic field, when is the torque on a magnet i) maximum and ii) minimum?	1
Q4.	Define angle of dip at a place. How does it change as one goes from magnetic pole to the magnetic equator.	2
Q5.	Define 'intensity of magnetisation' of a magnetic material. How does it vary with temperature for a paramagnetic materials.	2
Q6.	The susceptibility of a magnetic material in $2.6X10^{-5}$. Indentify the type of magnetic material and sate its two properties.	2
Q7.	Permanent magnets are made of special alloys while the cores of temporary magnets are made of soft iron. Why?	2
Q8.	Find expression of torque on a bar magnet due to external magnetic field.	3
Q9.	What happens when the temperature of a paramagnetic sample is lowered?	3
Q10	The vertical component of the earth's magnetic field at a given plac is $\sqrt{3}$ times its horizontal component. If total intensity of earth's magnetic field at the place is 0.4G, find the value of i) Angle of dip ii) The horizontal componet of earth's magnetic field.	3
Q11	How will a dia-, para- and a ferromagnetic material behave when kept in a non- uniform external magnetic field? Give two examples of each of these materials. Name two main characteritic of a ferromagnetic material which help us to decide its suitability for making i) a permanet magnet ii) an electromagnet	5
Q12.	Find magnetic field at 'o' due to two identical bar magnets of magnetic moment 'M'. 	5

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CLASS 12 SUBJECT Physics CHAPTER- 6 Electromagnetic Induction MM-30

Q1.	State Faraday's law of electromagnetic induction?.	1
Q2.	State the law that gives the polarity of the induced emf.	1
Q3.	Why the spark produced in the switch of a fan, when it is switched off?	1
Q4.	Define magnetic flux. Compute its dimensions.	2
Q5.	Distinguish between self induction and mutual induction.	2
Q6.	Why are the resistance coils double wound?	2
Q7.	Drive an expression for the self- inductance of a long solenoid of cross- sectional area A and length l, having n turns per unit length.	3
Q8.	Define the coefficient of mutual induction.	3
Q9.	What are the eddy currents? How are they produced? Describe briefly three main useful applications of eddy currents?	5
Q10.	Self induction is called the inertial of electricity. Why? If the self induction of an air core inductor increases from 0.01 mH to 10 mH on introducing an iron core into it, what is the relative permeability of the core used?	5
Q11.	a) Self inductance of a inductor coil having 100 turns is 20 mH. Calculate the magnetic flux through the cross- section of a coil corresponding to a current of 4mA. Also, find the total flux. b) An average induced emf of 0.4 V appears in a coil when the current in it is changed from 10 A in one direction to 10 A in opposite direction in 0.40 second. Find the coefficient of self induction of the coil.	5

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CLASS 12 SUBJECT Physics CHAPTER- 7 Alternating Current & Electrical Machines MM-30

Q1.	Capacitors block d.c. why?	1
Q2.	220 V ac is more dangerous more than 220 V dc. Why?	1
Q3.	When is the current in ac circuit wattles?	1
Q4.	Distinguish between average value and rms value of an alternating current.	2
Q5.	Drive an expression for the impedance of an a.c circuit consisting of an inductor and a resistor.	2
Q6	Prove that an ideal inductor does not dissipate power in a.c. circuit.	2
Q7.	Distinguish between reactance and impedance.	3
Q8.	Draw a labeled diagram of an ac generator. Write its applications on which its work.	3
Q9.	State the underline principle of a transformer. How is the large scale transmission of electric energy over long distances done with the use of transformers?	5
Q10.	a) Derive the relationship between the peak and the rms value of current in an a.c circuit. b) Show that in an a.c circuit containing a pure inductor, the voltage is ahead of current by $\pi/2$ phase.	5
Q11.	A coil of inductance 0.50 H and resistance 100 Ω is connected to a 240 V, 50Hz a.c supply. a) What is the maximum current is the coil? b) What is the time lag between the voltage maximum and the current maximum?	5

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CLASS 12 SUBJECT Physics CHAPTER- 8 Electromagnetic Waves MM-30

Q1.	What is displacement current due to?	1
Q2.	For which the frequency of light, the human eye is most sensitive.	1
Q3.	How are microwaves produced?	1
Q4.	State Maxwell Equations.	2
Q5.	Define intensity of an electromagnetic waves. Obtain an expression for it.	2
Q6	State four basic properties of electromagnetic waves.	
Q7.	Arrange the following electromagnetic radiations in ascending order of their frequencies : a) Microwaves b) Radio Waves c) X- Rays d) Gamma Rays	3
Q8.	Identify the following radio magnetic radiations as per wavelengths given below. Write one application of each. a) 1 mm b) 10^{-3} mm c) 10^{-8}m	3
Q9.	The oscillating magnetic field in a plane electromagnetic wave is given by : $B_y = (8X10^{-6}) \sin [2X10^{11} t + 300 \pi x]T$ i) Calculate the wavelength of the electromagnetic wave. ii) Write down the expression for the oscillating electric field.	5
Q10.	How does a charge q oscillating at certain frequency produce electronagnetic waves ? Sketch a schematic diagram depicting electric and magnetic fields for an electromagnetic wave propagating along the Z-direction.	5
Q11.	A capacitor, made of two parallel plants each of plate area A and separation d, is beign charged by an external ac soruce. Show that the displacement current inside the capacitor is the same as the current charging the capacitor.	5

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CLASS 12 SUBJECT Physics CHAPTER- 9 Ray Optics and Optical Instruments MM-30

Q1.	What is critical angle when ray go from one medium to another medium.	1
Q2.	Explain Snell's law of refraction.	1
Q3.	What is relation between focal length and radius of curvature of a mirrors.	1
Q4.	What are the condition of total internal reflection.	2
Q5.	What is Huygen's Principle?	2
Q6.	What do you mean by monochromatic and coherent sources.	2
Q7.	Find angular magnification of simple microscope.	2
Q8.	Find the expression : $\frac{\text{Real depth}}{\text{Apperent depth}} = \mu$ for plane surface refraction.	3
Q9.	Derive the formula : $\mu = \frac{\sin\left(\frac{A+Sm}{2}\right)}{\text{Sin}(A/2)}$ for a prism.	3
Q10.	Find angular magnification of a refracting telescope.	3
Q11.	Derive the formula : $\frac{\mu_2}{V} - \frac{\mu_1}{V} = \frac{\mu_2 - r_1}{e}$ on curve surface.	5
Q12.	Derive tens maker formula : $\frac{1}{f} = \left(\frac{r_2}{r_1} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$	5

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CLASS 12 SUBJECT Physics CHAPTER- 10 Wave Optics MM-30

Q1.	What is wave front?	1
Q2.	Define the term diffraction and find condition for it.	1
Q3.	Write relation between refractive index and Brewster's angle.	1
Q4.	Proof laws of reflection using Huygen's principle.	2
Q5.	For what distance is ray optics a good approximation when the aperture is 3 mm wide and the wavelength is 500 nm?	2
Q6.	Derive relation between Brew'ster's angle and refractive index.	2
Q7.	What is the shape of the wave front when light is diverging from a point source.	2
Q8.	a) The refractive index of glass is 1.5. What is the speed of light in glass. b) What is the Brewster angle for air to glass transition? (R.I of glass = 1.5)	3 3
Q9.	What is the Brewster angle for air to glass transition? (R.I of glass = 1.5	3
Q10.	Find angular magnification of a refracting telescope.	3
Q11.	Derive the formula : $\frac{\mu_2}{V} - \frac{\mu_1}{V} = \frac{\mu_2 - r_1}{e}$ on curve surface.	5
Q12.	Derive tens maker formula : $\frac{1}{f} = \left(\frac{r_2}{r_1} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$	5

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CLASS 12 SUBJECT Physics CHAPTER- 11 Dual Nature o Radiation & Matter MM-30

Q1.	Define the term stopping potential in relation to photo electronic effect.	1
Q2.	Plot a graph showing the variation of photo electric current with anode potential for two light beams of same wavelength but different intensity.	1
Q3.	Find the ratio of de-Broglie wavelength associated with two electron beams accelerated through 25V and 36v respectively.	2
Q4.	Define the terms 'Work Function' and 'Threshold frequency' for photo electric effect.	2
Q5.	Explain the function of photo-cell and gives its uses.	3
Q6.	Show that the de Broglie wavelength λ of electrons of energy k is given by the relation $\lambda=\frac{h}{\sqrt{2mk}}$	3
Q7.	An electron and a proton have same kinetic energy. Which of the two has greater wave length .	3
Q8.	Obtain the Einstein's photo electric equation. Explain how it is enable us to understand the : a) A linear dependence of maximum energy of the emitted electrons on the frequency of the incident radiation. b) The existence of a threshold frequency for a given photometer.	5
Q9.	Derive the expression for the de Broglie wavelength of an electron moving under a potential difference of V volt. Describe the Davisson and Germer experiment to established the wave nature of electron. Draw a labelled diagram for the apparatus used.	5
Q10.	An electron and a photon each have a wave length of 1 nm find : a) Their momenta b) The energy of a photon c) The kinetic energy of electon Take h = $6.63X10^{-34}$ J.s. b) For what kinetic energy of a neutron will the associated de Broglie wave length be $1.40X10^{-10}$m.	5

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CLASS 12 SUBJECT Physics CHAPTER- 12 Atoms MM-30

Q1.	Define distance of closest approach.	1
Q2.	What is Rydberg's constant? Give its value.	1
Q3.	Define ionization energy? What is its value for a hydrogen atom.	2
Q4.	The radius of the innermost electron orbit of a hydrogen atom is 5.3×10^{-11} m what are the radii of the n = 2 and n = orbits?	2
Q5.	The wavelength of the second line of the Balmer series in the hydrogen spectrum is 4861 A^0. Calculate the wavelength of the first time.	3
Q6.	Using Rydberg formula, calculate the longest wavelengths belonging to Lyman and Balmer series. In which region of hydrogen spectrum do these transitions lie? [Given $R = 1.1X10^7 m^{-1}$.]	3
Q7.	Calculate the impact parameter of a 5 MeV particle scattered by 90^0 when it approaches a gold nucleus.	3
Q8.	Obtain the expression for the frequency of radiation emitted when a hydrogen atom de-excites from level n to level (n-1). For large n, show that this frequency equals the classical frequency of revolution of the electron in the orbit.	5
Q9.	The total energy of an electron in the first excited state of the hydrogen atom is about – 3.4eV. a) What is the kinetic energy of the electron in this state? b) What is the potential energy of the electron in this state? c) Which of the answer above would change if the choice of the zero potential energy is changed?	5
Q10.	What is impact parameter? Show that Bohr's second postulate, 'the electron revolves around the nucleus only in certain fixed certain orbits without radiating energy' can be explained on the basis of de Broglie hypothesis of wave nature of electron.	5

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CLASS 12 SUBJECT Physics CHAPTER- 13 Nuclei MM-30

Q1.	What will be the ratio of the radii of two nuclei of mass numbers A_1 and A_2?	1
Q2.	Define the mass defect of a nucleus. How is it related to the binding energy of the nucleus?	1
Q3.	A radioactive substance decays to 1/32 of its initial activity in 25 days. Calculate its half life.	2
Q4.	Why are the control rods made of cadmium?	2
Q5.	Explain with an example whether the neutron-proton ratio in a nucleus or decreases due to beta decay.	3
Q6.	What is the different between photon and a neutrino?	3
Q7.	Prove that the instantaneous rate of change of the activity of a radioactive substance is inversely proportional to the square of its half life.	3
Q8.	Define the activity of a radionuclide. Write its SI Unit. Give a plot of a activity of a radioactive species v/s time. How long will a radioactive isotope, whose half life is T years, take for its activity to reduce to $1/8^{th}$ of its initial value.	5
Q9.	What do you mean by binding energy of a nucleus? Obtain an expression for binding energy. How binding energy per nucleon explain the stability of nucleus.	5
Q10.	What is radioactivity? State the laws of radioactive decay. Show that radioactive decay is exponential in nature.	5

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CLASS 12 SUBJECT Physics CHAPTER- 14 Semiconductors Devices & Digital Circuit MM-30

Q1.	What type of charge carriers are there in a p-type semi conductor.	1
Q2.	Which process causes depletion region in a p-n junction.	1
Q3.	Give the logic symbol of NAND gate.	2
Q4.	Why should a photodiode be operated at a reverse bias?	2
Q5.	With the help of a circuit diagram distinguish between forward biasing and reverse biasing of p-n junction diode.	3
Q6.	What is a Zener diode? How is it represented symbolically? With the help of a circuit diagram explain the use of Zener diode as a voltage regulator.	3
Q7.	Draw the circuit diagram of full-wave rectifier. Explain its working principle. Draw the input / Output, waveforms indicating clearly the functions of the two diodes used.	3
Q8.	Explain how an intrinsic semiconductor can be converted into (a) n type (ii p-type semiconductor. Give an example of each and their energy band diagrams.	5
Q9.	Draw the circuit diagram for the n-p-n transistor in common emitter configuration. With the help of typical input, output characteristics, write the expressions for (i) input resistance (ii) output resistance and (iii) current amplification factor. When would you prefer to use a transistor as a common base amplifier.	5
Q10.	For a common emitter transistor amplifier, the audio signal voltage across the collector resistance of 2 kΩ is 2V. If the current amplification factor of the transistor is 100, calculate (i) input signal voltage (ii) base current, (iii)power gain. Given that the value of base resistance is 1 k Ω.	5

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CLASS 12 SUBJECT Physics CHAPTER- 15 Communication System MM-30

Q1.	What is meant by term modulation?	1
Q2.	Name the type of communication systems according to the mode of transmission.	1
Q3.	Why do you need carrier waves of very high frequency in the modulation of signals?	2
Q4.	What should be the length of the dipole antenna for a carrier wave of frequency 3×10^8Hz?	2
Q5.	Why is ground wave transmission of signals restricted to a frequency of 1500 kHz?	3
Q6.	Why are short wave bands used for long distance transmission of signals?	3
Q7.	Define the term 'modulation index' for an AM wave. What would be the modulation index for an AM wave for which the maximum amplitude is 'a' while the minimum amplitude is 'b'?	3
Q8.	What is sky wave communication? Why is this mode of propagation restricted to the frequency only up to few Mhz.	5
Q9.	Is it necessary for the transmitting antenna and the receiving antenna to be of the same height for line of slight communication? Find an expression for maximum line of sight distance d_m between these two antennas of heights h_T and h_R.	5
Q10.	Explain the following terms used in communication system : a) Transducer b) Repeater c) Transmitter d) Bandpass Filter e) Amplification	5