

INSTITUTEOFAERONAUTICALENGINEERING

(Autonomous) Dundigal, Hyderabad-500043

FRESHMAN ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	APPLIED PHYSICS
Course Code	:	AHS008
Class	:	I B. Tech I Semester
Branch	:	Common for AE/ ME/ CE
Year	:	2016 - 2017
Course Coordinator	:	Dr.A Jayanth Kumar, Professor, Department of Freshman
Course Faculty	:	Dr. A Jayanth Kumar, Dr. Rizwana, Ms. S Charvani, Ms K Sowmya Mr K Saibaba, Mr N Rajeswara Rao, Mr V S K Prasad

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

S No	QUESTION	Blooms taxonomy level	Course Outcomes
	UNIT - I		
	DIELECTRIC AND MAGNETIC PROPERTIES		
Part - A	A(Short Answer Questions)		
1	Explain the terms: i Di-electric constant ii Electric polarization	Remember	1, 3
2	Explain the terms: i. Displacement vector ii. Electric susceptibility	Remember	1, 3
3	Explain the terms: i. Polarization vector ii. Polarizability	Remember	1, 3
4	Explain the terms: i. Electric dipole ii. Electric dipole ii. Electric dipole moment	Remember	1, 3
5	Define the types of polarizations in dielectrics.	Remember	1, 3
6	What is meant by polarization mechanism in dielectrics?	Remember	1, 3
7	What is electronic polarization?	Remember	1, 3
8	What is ionic polarization?	Remember	1, 3
9	What is orientation polarization?	Remember	1, 3
10	What is internal field in dielectric material?	Understand	1, 3
11	Write an expression for internal field in dielectric material.	Remember	1, 3

12	Explain the terms:	Domomhor	1 4
12	i. Magnetic induction ii. Magnetic susceptibility	Remember	1, 4
13	Explain the terms: i. Magnetic field intensity ii. Permeability	Remember	1, 4
14	Explain the terms: i. Relative permeability ii. Magnetic moment	Remember	1, 4
15	Explain Magnetization.	Remember	1,4
16	What is Bohr magneton? Explain.	Analyze	1,4
17	Mention the types of magnetic materials based on electron spins.	Analyze	1, 4
18	What hysteresis loop indicate?	Understand	1, 4
19	Define retentivity.	Understand	1, 4
20	Define coercivity.	Understand	1,4
Part - I	B (Long Answer Questions)		
1	What is meant by polarization mechanism in dielectrics? Discuss different polarization mechanism in dielectrics.	Understand	1, 3
2	What is electronic polarization? Derive an expression for electronic polarizability in terms of the radius of the atom.	Analyze	1, 3
3	What is ionic polarization? Derive an expression for ionic polarizability.	Analyze	1, 3
4	What is local field in a dielectric material? Derive an expression for it by Lorentz method	Analyze	1, 3
5	Explain the origin of magnetic moment. Find the magnetic dipole moments due to orbital and spin motions of an electron.	Remember	1,4
6	What are the characteristics of diamagnetic, paramagnetic and ferromagnetic substances? Explain their behaviour with the help of examples.	Understand	1, 4
7	Explain domain theory of ferromagnetism.	Understand	1,4
8	Explain the hysteresis curve exhibited by ferromagnetic material on the basis of domain theory	Understand	1,4
Part - C (Analytical Questions)			
1	Find the electric susceptibility of a dielectric gas having dielectric constant of 1.000041.	Apply	2, 3
2	A parallel capacitor has an area of 100cm ² , a plate separation of 1 cm and is charged to a potential of 100 Volts. Calculate the capacitance of the capacitor and the change on the plates.	Apply	2, 3
3	The dielectric constant of He gas is 1.0000684. Find the electronic polarizability of He atoms if the gas contains 2.7×10^{25} atoms per m ³ .	Apply	2, 3
4	A solid dielectric with density 3 x 10^{28} atoms / m ³ shows an electronic polarizability of 10^{-40} farad m ² . Assuming the internal electric field to be a Lorentz field, calculate the dielectric constant of the material.	Apply	2, 3
5	A parallel capacitor of area 650 mm ² and a plate separation of 4 mm has a charge of $2x10^{-10}$ C on it. When a material of dielectric constant 3.5 is introduced between the plates, what is the resultant voltage across the capacitors.	Apply	2, 3
6	Calculate magnetization and magnetic flux density if magnetic field intensity 250amp/m and relative permeability is 15.	Apply	2,4
7	Find relative permeability, if H=220amp/m and M=3300 amp/m.	Apply	2, 4
8	Find its permeability and relative permeability if the magnetic susceptibility of aluminum is 2.3×10^{-5} .	Apply	2, 4
9	Find the relative permeability of the material if a magnetic field of strength 300 amp/meter produces a magnetization of 4200 A/m in a ferromagnetic material.	Apply	2, 4

10	Calculate the magnetization and magnetic flux density in the material of a para magnetic material of magnetic field intensity of 10^4 A/m. Given the susceptibility of the material at room temperature is 3.7×10^{-3} .	Apply	2, 4	
	UNIT - II ACOUSTICS AND ULTRASONICS			
Part –	A (Short Answer Questions)			
1	Define the term Reverberation. What is Reverberation time?	Understand	5	
2	Explain Sabine's formula.	Remember	5	
6	What are ultrasonic waves?	Analyze	6	
7	What is magnetostrictioin effect?	Remember	6	
8	Explain piezo-electric effect.	Understand	6	
9	Explain the term SONAR.	Remember	6	
10	Which method is suitable to produce high frequency in order 1×10^8 Hz.	Analyze	6	
11	Write the properties of ultrasonic waves.	Understand	6	
12	Write the relation between natural frequency'f 'young's modulus 'Y' density of material ' ρ ' and length of the rod 'L'.	Remember	6	
13	What are merits and demerits of magnetostrictioin method?	Analyze	6	
14	What are merits and demerits of piezo-electric method?	Analyze	6	
Part - I	3 (Long Answer Questions)			
1	Define the terms: i. Reverberation ii. Reverberation time iii. Absorption coefficient of a material.	Understand	5	
2	Describe an experimental method to determine the sound absorption coefficient of a material.	Understand	5	
3	Discuss the factors which are affecting the architectural acoustics and suggest your remedy.	Analyze	5	
6	Explain magnetostrictioin method of producing ultrasonic waves.	Remember	6	
7	Describepiezo-electric method for production of ultrasonic waves.	Understand	6	
8	Describe the method of determining the depth of sea using SONAR.	Understand	6	
9	Describe the applications of ultrasonic waves.	Understand	6	
10	List out some of the medical applications of ultrasonics.	Analyze	6	
Part - (Part - C (Analytical Questions)			
1	A hall of volume 85000 m^3 is found to have a reverberation time of 2.2 seconds. If the area of the sound absorbing surface is 7500 m^2 , calculate average sound absorption coefficient.	Apply	2, 5	
2	A hall has a volume of 1500 m^3 . Its total absorption is equivalent to 100 m^2 of open window. Determine the effect on the Reverberation time if the absorption is increased by 100 m^2 of open window by filling the hall with audience.	Apply	2, 5	
3	The volume of a hall is 475 m^3 . The area of wall is 200 m^2 , area of floor and ceiling each is 100 m^2 . If absorption coefficient of the wall, ceiling and floor are 0.025, 0.02 and 0.55 respectively, calculate the reverberation time for the hall.	Apply	2, 5	

4	 The volume of as auditorium is 9500 cubic meters. The period of reverberation is found to be 1.5 sec. (a) Calculate the total absorption in the auditorium. (b) If the floor of the auditorium is now covered with carpets where the total absorption is found to have increased by 100 sabines, calculate the new period of reverberation. 	Apply	2, 5
5	A quartz crystal of thickness 0.0001m is vibrating at resonance. Calculate the fundamental frequency when $Y=7.9\times10^{10}$ N/m ² and $\rho = 2650$ Kg/m ³ .	Apply	2, 6
6	A quartz crystal of thickness 0.0001m is vibrating at resonance. Calculate the velocity of ultrasonic wave of $Y=7.9\times10^{10}$ N/m ² and $\rho = 2650$ Kg/m ³ .	Apply	2, 6
	UNIT-III FOULI IBBILIM OF SYSTEM OF FORCES		
Part - A	A (Short Answer Questions)		
1	Define force and write its units.	Remember	7
2	Differentiate between elastic and a rigid body.	Understand	7
3	What are concurrent forces?	Analyze	7
4	Explain the condition for equilibrium of concurrent forces in a plane.	Understand	8
5	Obtain a relation for α in term's of Ra and W in the fallowing diagram. Ra = Radius of the sphere suspended with a string of tension S. W = Weight of the sphere.	Analyze	8
6	Explain moment of force.	Understand	8
7	State and explain varignon's theorem with an example	Remember	8
Part –	B (Long Answer Questions)		
1	Explain parallelogram law of forces.	Understand	7
2	Explain triangle law of forces.	Understand	7
3	Obtain a relation for resultant and concurrent forces in space.	Analyze	8
4	Explain Lami's theorem.	Understand	7
5	Explain couple. Write the characteristics of couple.	Understand	8
Part - C (Analytical Questions)			
1	If two forces P and Q act on a body at an angle θ between them. Obtain an equation for resultant forcer R. Discuss special cases when $\theta=0^{\circ}$, $\theta=90^{\circ}$ and $\theta=180^{\circ}$.	Apply	2, 7
2	Four forces of 10N, 20N, 25N and 40N are concurrent in space at origin and passing through the points (3, 2); (1, 7); (4, -2) and (-2, 4) respectively. Determine the resultant system of force.	Apply	2,7



	Determine magnitude and direction of resultant of all the three forces on		
5	the hook shown in the figure. y 70 N 25° 80 N 45° 90 N	Apply	2, 8
6	A force of 100N is applied at the top end of a rod AB, placed at 60° with horizontal. Find the momentum about bottom end A of the rod.	Apply	2, 8
7	Determine horizontal force P to be applied on the block of weight 1500N to hold it in fixed position on a smooth inclined plane AB of angle angle 30° with horizontal.	Apply	2, 7
	UNIT-IV FRICTION		
Part –	A (Short Answer Questions)		
1	Explain the concept of friction.	Understand	9
2	What is limiting friction?	Remember	9
3	State laws of friction.	Remember	9
4	Explain angle of repose.	Remember	9
5	What are the advantages of friction?	Analyze	10
6	What are the disadvantages of friction?	Analyze	10
7	What are various steps to be taken to reduce the friction?	Analyze	9
Part –	B (Long Answer Questions)		
1	Derive an equation for acceleration of body of mass 'm' sliding down the inclined plane at an angle ' θ ' with horizontal.	Remember	10
2	Show that pushing of lawn roller requires more force than pulling.	Analyze	10
3	Explain the cause of friction.	Understand	9
4	Give examples to show that friction is both friend and foe.	Analyze	10
Part - C (Analytical Questions)			
1	A body of mass M_1 placed on rough horizontal plane connected with a string over a friction less pulley. The second end of the string to connect to M_2 suspended vertically down wards. If both the masses moving with uniform acceleration. Find tension in the string and also if the horizontal plane is friction less find the tension.	Apply	2, 10
2	Two bodies of masses M_1 and M_2 connected by a thin mass less string over a pulley. M_1 slides up over on inclined plane of θ° with horizontal and M_2 move vertically down with uniform acceleration. Find tension in the string for (a) for coefficient of friction (b) friction less inclined plane	Apply	2, 10

3	A ladder 7m long rests against a wall and makes 45° with the ground. a man of height half of weight of ladder climbs it. At what distance along the ladder will be, when the ladder is about to slip? Given the coefficient of friction between the ladder and the wall is $1/3$ and ladder and floor is $\frac{1}{2}$.	Apply	2, 10
4	A man weighing 75N stands in the middle of a ladder AB of 25N weight resting on smooth floor at A. The base of the ladder is 2m away from wall. The top of the ladder B touches the wall at a height 4m from the ground. The ladder is prevented from slipping by a string OD which makes an angle 30° with horizontal at the bottom of the wall. The string OD is perpendicular to the ladder. Find the tension in the string.	Apply	2, 10
5	A man weighing 100N stand in the middle of a ladder of negligible mass. The bottom end of the ladder is supported and stopped by a step. The ladder makes an angle 60° with horizontal and launches the wall at a height 4m from the ground. Calculate reaction at the bottom and top of the ladder.	Apply	2, 10
	UNIT-V		
Part - /	A (Short Answer Questions)		
1	Define moment of inertia	Domomhor	11
2	Explain radius of suration. What is its physical significance?	Understand	11
2	Explain radius of gyration. What is its physical significance?	Diderstand	11
3	State parallel axis theorem.	Remember	11
4	State perpendicular axis theorem.	Remember	11
5	Write the relation for moment of inertia of a thin rod of length 1, mass 'M'.	Analyze	12
6	The length and breadth of rectangular plate of mass M are 'l' and 'b'. What is its moment of inertia about an axis passing through mid point and parallel to its breadth 'b'.	Analyze	12
7	Write a relation of moment of inertia of circular disc about its centre (a) Perpendicular to disc (b) Along diameter	Remember	11
Part - B (Long Answer Questions)			
1	State and prove perpendicular axes theorem.	Remember	11
2	State and prove parallel axes theorem.	Remember	11
3	Calculate moment of inertia of thin rod of length 'L' and mass 'M'.	Analyze	11
4	Calculate moment of inertia of a rectangular lamina of length 'L', breadth 'b' and mass 'm', about an axis passing through centroid (a) parallel to length (b) parallel to breadth	Apply	12
5	Calculate moment of inertia of a rectangular lamina of length 'L', breadth 'b' and mass 'm', about an axis passing through centroid (a) along the length (b) along the edge breadth	Apply	12
6	 Derive a relation for moment of inertia of circular disc (a) along the diagonal . (b) along the perpendicular passing through centroid. 	Analyze	12
7	 Calculate moment of inertia of a rectangular lamina of length 'L', breadth 'b' and mass 'm', about an axis passing through centroid (a) from the centroid perpendicular to lamina. (b) at one of the vertex perpendicular to lamina. 	Apply	12
Part - C (Analytical Questions)			
1	A thin wheel has moment of inertia 70 kg- m^2 and its diameter is 4.4cm. How much pulling force is to be applied on the thread wound on axle to produce an angular acceleration 0.5 rad s ⁻¹ .	Apply	2, 12
2	Calculate MI of a rectangular lamina about centroid and perpendicular to it of mass is 2Kg. Length 10cm breadth 4cm.	Apply	2, 12

3	Determine MI of about diameter of circular disc of mass 500g and radius 8cm.	Apply	2, 12
4	A thin metal rod mass 40 g is suspended . Calculate the moment of inertia of the rod.	Apply	2, 12
5	A thin rod of negligible mass is attached along the length of a rectangular plate. The length and breadth of the plate are 6cm and 3cm. If the mass of the plate is 900g. Find the moment of inertia of plate along the thin rod	Apply	2, 12

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