INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

CIVIL ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	**ENGINEERING MECHANICS**
Course Code	:	**AMEB03**
Program	:	**B. Tech**
Semester	:	**III**
Branch	:	**Civil Engineering**
Section	:	**A & B**
Academic Year	:	**2019 - 2020**
Course Faculty	:	**Dr. U Vamsi Mohan, Professor**

COURSE OBJECTIVES:

	The course should enable the students to:
I	Ability to work comfortably with basic engineering mechanics concepts required for analyzing static structures
II	Identify an appropriate structural system to studying a given problem and isolate it from its environment, model the problem using good free-body diagrams and accurate equilibrium equations
III	Identify and model various types of loading and support conditions that act on structural systems, apply pertinent mathematical, physical and engineering mechanical principles to the system to solve and analyze the problem.
IV	Understand the meaning of center of gravity (mass)/centroid and moment of Inertia using integration methods and method of moments

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		MODULE-I				
1	What is mechanics?	Engineering mechanics is the study of forces that act on bodies and the resultant motion that those bodies experience.	Remember	CO1	CLO 1	AMEB03.01
2	What is statics?	Statics is a branch of Engineering Mechanics which deals with the forces acting on the rigid bodies that are at rest.	Understand	CO1	CLO 1	AMEB03.01
3	What is dynamics?	Dynamics is that branch of Engineering Mechanics which deals with the forces acting on the rigid bodies that are in motion.	Remember	CO1	CLO 1	AMEB03.01

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
4	Define kinematics?	Kinematics is that branch of Dynamics which deals with the geometry of motion without considering the forces causing the motion.	Remember	CO1	CLO 1	AMEB03.01
5	Define kinetics?	Kinetics is that branch of Dynamics which deals with the motion of rigid bodies along with the forces causing the motion..	Understand	CO1	CLO 1	AMEB03.01
6	Define Force	Any action that tends to maintain or alter the motion of a body or to distort it is said to be force.	Understand	CO1	CLO 1	AMEB03.01
7	Define Moment	Moment is the measure of the capacity or ability of the force to produce twisting or turning effect about an axis, perpendicular to the plane containing the line of action of the force.	Remember	CO1	CLO 2	AMEB03.02
8	Define Momentum	Momentum of a force is defined as the product of the mass of the object and its velocity. Mathematically, Momentum = mass x velocity = mv	Remember	CO1	CLO 2	AMEB03.02
9	Define Impulse	Impulse is the change of momentum of an object when the object is acted upon by a force for an interval of time.	Understand	CO1	CLO 2	AMEB03.02
10	What is a Rigid body?	A body is said to be rigid, if the distance between any two given points in the body remains constant, even under the action of external force system	Remember	CO1	CLO 1	AMEB03.01
11	State Newton's First Law	Newton's First Law states that an object will remain at rest or in uniform motion in a straight line unless acted upon by an external force.	Understand	CO1	CLO 1	AMEB03.01
12	State Newton's Second Law	The second law states that the rate of change of momentum of a body is directly proportional to the force applied, and this change in momentum takes place in the direction of the applied force.	Remember	CO1	CLO 1	AMEB03.01
13	State Newton's Third Law	The third law states that, for every action, there is an equal and opposite reaction	Remember	CO1	CLO 1	AMEB03.01
14	State Newton's Law of gravitation	Newton's law of universal gravitation states that every particle attracts every other particle in the universe with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers.	Understand	CO1	CLO 1	AMEB03.01

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15	What is a Force system?	Several forces acting simultaneous on a body constitutes a force system.	Understand	CO1	CLO 2	AMEB03.02
16	What is a Particle?	A particle is a matter having considerable mass but negligible dimensions.	Understand	CO1	CLO 1	AMEB03.01
17	What is meant by Resolution of a force?	The process of breaking(resolving) the force into number of components which produce the same effect as that of the given force.	Understand	CO1	CLO 2	AMEB03.02
18	What is meant by Composition of forces?	The replacement of two or more forces acting on a body by a single force, known as resultant force.	Understand	CO1	CLO 2	AMEB03.02
19	Define a Couple	The moment produced by two equal and opposite non-collinear parallel forces is said to be Couple.	Understand	CO1	CLO 3	AMEB03.03
20	What are Concurrent forces?	A number of concentrated forces passing through a common point of intersection are said to be concurrent forces.	Remember	CO1	CLO 2	AMEB03.02
21	What are Coplanar forces?	A number of forces having their lines of action in the same plane are said to be coplanar forces.	Remember	CO1	CLO 2	AMEB03.02
22	State Varignon's theorem.	Varignon's theorem states that the algebraic sum of the moments of all the forces in a system about any point is equal to the moment of their resultant force about the same point.	Remember	CO1	CLO 4	AMEB03.04
23	Define Equilibrium	If the resultant of a number of forces, acting on a body is zero, then that body is said to be in equilibrium.	Understand	CO1	CLO 3	AMEB03.03
24	State Lami's Theorem	Lami's theorem states that, if any body is in equilibrium under the action of only three coplanar concurrent forces then each force is directly proportional to the sine of the angle between the other two forces.	Remember	CO1	CLO 2	AMEB03.02
25	What is a Free Body Diagram?	Pictorial representation of a body which isolated from the all the contact surfaces (supports) and considering the reaction at contact surfaces along with external forces.	Understand	CO1	CLO 2	AMEB03.02
26	What is Equilibrant?	The force which brings the system of forces into a equilibrium is called an equilibrant. It is equal in magnitude and opposite in direction to the resultant.	Understand	CO1	CLO 4	AMEB03.04

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		MODULE-II				
1	What is Friction?	When two bodies are in contact, and an effort to move one body over the other is resisted. This resistance to motion is called friction.	Remember	CO 2	CLO5	AMEB03.05
2	Define Coefficient Friction	A coefficient of friction is a value that shows the relationship between the force of friction between two objects and the normal reaction between the objects that are involved.	Remember	CO 2	CLO5	AMEB03.05
3	What is Dry Friction?	The friction that exists between perfectly cleaned and dry solid surfaces is called dry friction.	Understand	CO 2	CLO5	AMEB03.05
4	What is Fluid friction?	The Thick layer of oil lubricant is introduced between two surfaces, the friction between surfaces are separated by a film of lubricant is called fluid friction.	Remember	CO 2	CLO5	AMEB03.05
5	What is Non-viscous friction?	The thin layer of lubricant is allowed to prevent the direct contact between surfaces and reduces the friction. The friction that exists between the surfaces is called non-viscous friction.	Remember	CO 2	CLO5	AMEB03.05
6	What is Limiting friction?	The maximum friction that can be generated between two static surfaces in contact with each other is called limiting friction.	Understand	CO 2	CLO5	AMEB03.05
7	Define Angle of friction.	It is the angle of a plane to the horizontal when a body placed on the plane will just start to slide.	Remember	CO 2	CLO5	AMEB03.05
8	What is Angle of repose?	Angle of repose is defined as the minimum angle of an inclined plane which causes an object to slide down the plane.	Understand	CO 2	CLO5	AMEB03.05
9	What is a Beam?	It is a horizontal structural element that primarily resists loads applied transverse to the beam's axis.	Remember	CO 2	CLO8	AMEB03.08
10	What is Static friction?	In static friction the force applied to the body is not sufficient to move the body, and then the friction acting on the body is called static friction.	Remember	CO 2	CLO5	AMEB03.05
11	What is Kinetic friction?	The friction acting on a body which is actually in motion is called kinetic friction	Understand	CO 2	CLO5	AMEB03.05

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
12	What is a Truss?	A structural that is made of straight slender bars that are joined together at their ends by frictionless pins to form a pattern of triangle is called truss.	Remember	CO 2	CLO7	AMEB03.07
13	What are the Types of beams?	Cantilever, simple supported, over-hanged, continuous, fixed and propped cantilever.	Remember	CO 2	CLO8	AMEB03.08
14	What is a Cantilever beam?	A beam with one end fixed(built in) and other end free.	Remember	CO 2	CLO8	AMEB03.08
15	What is a Continuous beam?	A beam with more than one span.(two or more)	Remember	CO 2	CLO8	AMEB03.08
16	What is a Simply supported beam?	A beam with one end hinged and other end on rollers.	Remember	CO 2	CLO8	AMEB03.08
17	What is a Fixed beam?	A beam with both the ends fixed (builtin)	Remember	CO 2	CLO8	AMEB03.08
18	What is a Propped cantilever?	A beam with one end fixed and the other end simply supported.	Remember	CO 2	CLO8	AMEB03.08
19	What is a Determinate beam?	A beam which can be analysed by using static equilibrium equations is said to be determinate.	Remember	CO 2	CLO8	AMEB03.08
20	What is an Indeterminate beam?	A beam which cannot be analysed by using static equilibrium equations is said to be indeterminate.	Remember	CO 2	CLO8	AMEB03.08
21	What is a Screw jack?	A simple lifting device	Remember	CO 2	CLO6	AMEB03.06
22	What is Lead distance?	The distance which the screw advances in one turn is called lead distance.	Remember	CO 2	CLO6	AMEB03.06
23	Define the Efficiency of screw jack?	The efficiency of screw jack is defined as the ratio of the work output to the work input over the same period of time. $\eta = \dfrac{tan\,\alpha}{tan(\alpha+\phi)}$	Remember	CO 2	CLO6	AMEB03.06
MODULE-III						
1	Define Center of gravity	Centre of gravity is a point where the whole weight of the body is assumed to concentrate.	Remember	CO 3	CLO9	AMEB03.09
2	Define Centroid	It is a point where the whole area of a plane is supposed to concentrate.	Remember	CO 3	CLO9	AMEB03.09
3	State parallel axis theorem	Parallel axis theorem states that the MI of a plane area with respect to any reference axis in its plane is equal to the sum of MI with respect to a parallel centroid axis and product of the total area and the square of the distance between the two axes.	Remember	CO 3	CLO10	AMEB03.10

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
4	State perpendicular axis theorem	Perpendicular axis theorem states that the moment of inertia of an area with respect to an axis perpendicular to that x-y plane and passing through the origin will be equal to the sum of moment of inertia of the same area about x-x, y-y axis.	Remember	CO 3	CLO10	AMEB03.10
5	What is Radius of gyration?	Radius of gyration is defined as the distance from the axis of rotation to a point where the total mass of the body is supposed to be concentrated, so that the moment of inertia about the axis may remain the same.	Remember	CO 3	CLO10	AMEB03.10
6	Define Moment of inertia	It is the product of area and the square of its moment arm about a reference axis is called moment of inertia.	Remember	CO 3	CLO10	AMEB03.10
7	Define Mass moment of inertia?	It is the product of mass and the square of its moment arm about a reference axis is called mass moment of inertia.	Remember	CO 3	CLO11	AMEB03.11
8	State Pappus-Guldinus theorem for area.	The area of surface generated by revolving a plane curve about non-intersecting axis in the plane of the curve is equal to the length of the generating curve times the distance travelled by the centroid of the curve in the revolution and angle of rotation.	Remember	CO 3	CLO9	AMEB03.09
9	State Pappus-Guldinus theorem for volume.	The volume of a solid generated by revolving a plane area about a non-intersecting axis in the plane is equal to the area of the generating plane times the distance travelled by the centroid of the plane area and its rotation.	Understand	CO 3	CLO9	AMEB03.09
10	Explain polar moment of inertia.	Moment of inertia about an axis perpendicular to the plane of an area is known as polar moment of inertia.	Understand	CO 3	CLO10	AMEB03.10
11	What is the concept of virtual work?	Virtual work is the total work done by the applied forces and the inertial forces of a mechanical system as it moves through a set of virtual displacements. When considering forces applied to a body in static equilibrium, the principle of least action requires the virtual work of these forces to be zero.	Remember	CO 3	CLO12	AMEB03.12
12	What is the Degree of freedom?	It is defined as the minimum number of independent variables required to define the position or motion of a system is known as degree of freedom.	Remember	CO 3	CLO12	AMEB03.12

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
13	Define Work done.	The work done by a force on a moving body is defined as the product of the force and the distance moved in the direction of the force.	Remember	CO 3	CLO12	AMEB03.12
14	What is Kinetic energy?	The kinetic energy of an object is the energy that it possesses due to its motion. It is defined as the work needed to accelerate a body of a given mass from rest to its stated velocity.	Remember	CO 3	CLO12	AMEB03.12
15	What is Potential energy?	Potential energy is defined as mechanical energy, stored energy, or energy caused by its position.	Remember	CO 3	CLO12	AMEB03.12
16	What is Virtual work?	Virtual work is the product of the force/moment and corresponding virtual displacement/rotation.	Remember	CO 3	CLO12	AMEB03.12
17	State the Principle of virtual work.	The principle of virtual work states that for a system of initially stationary rigid bodies, the algebraic summation of virtual work done by all effective forces causing virtual displacement consistent with geometrical conditions, will be zero.	Remember	CO 3	CLO12	AMEB03.12
		MODULE-IV				
1	What is motion?	The continuous change in position of a body with respect to time and relative to the reference point or observer is called motion.	Remember	CO 4	CLO13	AMEB03.13
2	Define kinetics	Kinetics is the branch of classical mechanics that is concerned with the relationship between motion and its causes, specifically, forces and torques.	Remember	CO 4	CLO13	AMEB03.13
3	Define translation	If a straight line drawn on the moving body remains parallel to its original then such motion is called translation.	Remember	CO 4	CLO13	AMEB03.13
4	Explain the term rectilinear motion?	If the path followed by a point is a straight line then such motion is called rectilinear motion.	Understand	CO 4	CLO14	AMEB03.14
5	Define curvilinear motion?	If the path followed by a point is a curve then such motion is called a curvilinear motion.	Remember	CO 4	CLO14	AMEB03.14
6	Define term plane motion?	Plain motion is combination of both translation and rotation.	Remember	CO 4	CLO14	AMEB03.14
7	What do you mean by a position?	Position means the location of a particle with respect to origin.	Remember	CO 4	CLO13	AMEB03.13

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8	What is projectile motion?	If a particle is freely thrown in air along any direction, other than vertical it will follow a curves path which is parabolic in nature. This motion is a called projectile.	Remember	CO 4	CLO13	AMEB03.13
9	What is meant by speed?	The rate of change of distance with respect to time is called speed.	Remember	CO 4	CLO13	AMEB03.13
10	Define trajectory?	The path traced by a projectile is called trajectory.	Remember	CO 4	CLO15	AMEB03.15
11	Define time of flight?	The time taken by projectile to move from point of projection to point of target is called time of flight.	Remember	CO 4	CLO15	AMEB03.15
12	What is maximum height?	When projectile reaches to the max height where vertical component of velocity is zero	Remember	CO 4	CLO15	AMEB03.15
13	What is range?	It is a horizontal distance from point of projection to point of target is called a range.	Remember	CO 4	CLO15	AMEB03.15
14	Explain the term rigid body?	A body is said to be rigid, if the relative position of any two particles do not change under the action of force.	Understand	CO 4	CLO14	AMEB03.14
15	Define the term angular velocity?	It defines the rate of change of angular position with respect to time.	Remember	CO 4	CLO14	AMEB03.14
16	What is Newton's second law?	The second law states that the rate of change of momentum of a body is directly proportional to the force applied, and this change in momentum takes place in the direction of the applied force.	Remember	CO 4	CLO14	AMEB03.14
MODULE-V						
1	Explain the Vibration?	If the body is given a small displacement from the position, a force comes into play which tries to bring the body back to the equilibrium point, giving rise to oscillations or vibrations	Understand	CO 5	CLO19	AMEB03.19
2	What is Simple harmonic motion?	Oscillatory motion under a retarding force proportional to the amount of displacement from an equilibrium position is called simple harmonic motion.	Remember	CO 5	CLO17	AMEB03.17
3	Describe longitudinal waves.	Longitudinal waves are waves in which the displacement of the medium is parallel to the direction of propagation of the wave.	Understand	CO 5	CLO19	AMEB03.19
4	What is Damped Vibration?	The oscillatory motion in which the amplitude decreases continuously with the passage of time is known as damped oscillation.	Remember	CO 5	CLO19	AMEB03.19

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
5	What are "Forced / Driven Vibration	All free oscillations eventually die out because of the ever present damping forces. However, an external agency can maintain these oscillations. These are called forced or driven oscillations	Remember	CO 5	CLO19	AMEB03.19
6	Define the term degree of freedom?	It is defined as the minimum number of independent variables required to define the position or motion of a system is known as degree of freedom.	Remember	CO 5	CLO17	AMEB03.17
7	Explain term about "Resonance"	When the driving frequency is equal to the natural frequency the oscillations can be large - this is called resonance	Understand	CO 5	CLO18	AMEB03.18
8	Recall wavelength.	A wavelength is a measure of distance between two identical peaks or crests.	Remember	CO 5	CLO17	AMEB03.17
9	Define frequency.	Frequency is the number of occurrences of a repeating event per unit time.	Remember	CO 5	CLO17	AMEB03.17
10	Define pendulum?	A pendulum is a weight suspended from a pivot so that it can swing freely. When a pendulum is displaced sideways from its resting, equilibrium position, it is subject to a restoring force due to gravity that will accelerate it back toward the equilibrium position.	Remember	CO 5	CLO17	AMEB03.17
11	Define amplitude.	The maximum extent of a vibration or oscillation, measured from the position of equilibrium.	Remember	CO 5	CLO17	AMEB03.17
12	Define time period for simple pendulum?	It the time needed for one complete cycle of vibration to pass in a given point.	Understand	CO 5	CLO18	AMEB03.18
13	What is meant by torsional pendulum?	A torsion pendulum is a mass suspended on a string that rotates periodically. When the mass of a torsion pendulum is rotated from its equilibrium position, the fiber resists the rotation and provides a restoring force that causes the mass to rotate back to its original equilibrium position.	Remember	CO 5	CLO18	AMEB03.18
14	What is meant by compound pendulum?	Any swinging rigid body free to rotate about a fixed horizontal axis is called a compound pendulum	Remember	CO 5	CLO18	AMEB03.18
15	Explain about under-damped systems.	An under-damped system yields an exponentially decreasing sinusoidal output in response to a step input.	Understand	CO 5	CLO19	AMEB03.19

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
16	Describe critically-damped systems.	A critically damped system the minimum amount of damping that will yield a non- oscillatory output in response to a step input.	Understand	CO 5	CLO19	AMEB03.19
17	What do you mean by over-damped systems?	An over-damped system also yields a non-oscillatory output in response to a step input, but has more damping than necessary to achieve the non-oscillatory output.	Understand	CO 5	CLO19	AMEB03.19

Signature of the Faculty   **HOD, CE**