



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

CIVIL ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	ADVANCED STRUCTURAL ANALYSIS AND DESIGN
Course Code	:	ACE016
Program	:	B.Tech
Semester	:	VII
Branch	:	CivilEngineering
Section	:	A & B
Academic Year	:	2019- 2020
Course Faculty	:	Dr. Venu M, Professor

COURSE OBJECTIVES:

The course should enable the students to:	
I	Enhance knowledge of matrix stiffness and flexibility methods for analyzing continuous beams, portal frames and trusses.
II	Design advanced structures such as retaining walls against lateral earth pressure.
III	Analyze and design the different types of piles and flat slabs as per the recommendations of Indian Standard codes.
IV	Explore and interpret the basic design concepts of water tanks, silos and bunkers.

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
UNIT-I						
1	What is matrix method of analysis?	The matrix method is a structural analysis method used as a fundamental principle in many applications. The method is carried out, using either a stiffness matrix or a flexibility matrix.	Understand	CO 1	CLO 1	ACE016.01
2	What is static indeterminacy?	Static indeterminacy- when internal forces and reactions are greater than static equilibrium equations.	Remember	CO 1	CLO 1	ACE016.01
3	What is kinematic indeterminacy?	Kinematic indeterminacy- when number of unknown displacement greater than number of compatibility equations.	Remember	CO 1	CLO 2	ACE016.02
4	What is degree of static indeterminacy?	An indeterminate system is often described with the number of redundants it posses and this	Remember	CO 1	CLO 1	ACE016.01

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		number is known as its. degree of static indeterminacy .				
5	What is kinematically indeterminate structure?	A kinematically determinate structure can be defined as a structure where, if it is possible to find nodal displacements compatible with member extensions, those nodal displacements are unique.	Remember	CO 1	CLO 1	ACE016.01
6	What is degree of redundancy in structures?	A redundant or indeterminate structure has more structure than is absolutely necessary. So, if some part of the structure is damaged or removed, the structure will not necessarily fail or collapse, as another part can bear the load of the damaged or missing piece.	Remember	CO 1	CLO 1	ACE016.01
7	What is meant by stiffness matrix?	In the finite element method for the numerical solution of elliptic partial differential equations, the stiffness matrix represents the system of linear equations that must be solved in order to ascertain an approximate solution to the differential equation.	Remember	CO 1	CLO 1	ACE016.01
8	What are the basic unknowns in stiffness matrix method?	Stiffness method of analysis of structure also called as displacement method. In the method of displacement are used as the basic unknowns.	Remember	CO 1	CLO 2	ACE016.01
9	What is stiffness and flexibility?	Stiffness is the extent to which an object resists deformation in response to an applied force. The complementary concept is flexibility or pliability: the more flexible an object is, the less stiff it is.	Remember	CO 1	CLO 2	ACE016.01
10	What is a flexibility matrix?	Flexibility matrix refers to the adaptability strategy, additionally called the technique for reliable deformations. In this matrix, there are basic unknown member forces.	Remember	CO 1	CLO 3	ACE016.01
11	What are the uses of flexibility matrix?	Flexibility matrix is widely used in analyzing beams, frames, and trusses.	Remember	CO 1	CLO 4	ACE016.04
12	What is sway correction?	Sway correction is defined as the removal of lateral movement in the beams or frames by correction factor is multiplied by corresponding sway moment.	Remember	CO 1	CLO 4	ACE016.04
13	What is degree of static indeterminacy?	Degree of static indeterminacy = Total number of unknown forces. - Number of independent equations of equilibrium.	Understand	CO 1	CLO 1	ACE016.01
14	What makes a beam statically indeterminate?	In regards to beams, if the reaction forces can be calculated using equilibrium equations	Remember	CO 1	CLO 2	ACE016.02

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		alone, they are statically determinate				
15	What is single storey frame?	Single-storey frames use various column and portal frame solutions, combined with typically hollow section trusses.	Remember	CO 1	CLO 5	ACE016.01
UNIT-II						
1	what is approximation method of analysis	Approximate analysis is conducted by making realistic assumptions about the behavior of the structure. Approximate Analysis of Indeterminate Trusses During preliminary design and analysis, the actual member dimensions are not usually known.	Remember	CO 2	CLO 7	ACE016.07
2	What is portal frame method?	Portal Frame Portal frames, used in several Civil Engineering structures like buildings, factories, bridges have the primary purpose of transferring horizontal loads applied at their tops to their foundations.	Remember	CO 2	CLO 7	ACE016.07
3	What is substitute frame method?	Substitute frame method for analysis of multistory frame can be handy in approximate and quick analysis. This method has been applied only for vertical loading conditions.	Understand	CO 2	CLO 9	ACE016.09
4	What is called as portal frame?	Portal frames are a type of structural frame, that, in their simplest form, are characterised by a beam (or rafter) supported at either end by columns, however, the joints between the beam and columns are 'rigid' so that the bending moment in the beam is transferred to the columns.	Understand	CO 2	CLO 9	ACE016.09
5	What is concrete portal frame?	Concrete Portal Frames are a combination of two columns and a normal beam with additional bending strength, to form a U shape.	Understand	CO 2	CLO 9	ACE016.09
6	What does gravity load mean?	A gravity load is one that the downward force of gravity affects.	Remember	CO 2	CLO 9	ACE016.09
7	What is a lateral load?	Most lateral loads are live loads whose main component is a horizontal force acting on the structure. Typical lateral loads would be a wind load against a facade, an earthquake, the earth pressure against a beach front retaining wall or the earth pressure against a basement wall.	Remember	CO 2	CLO 7	ACE016.07

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8	What is single storey frame?	Single-storey frame and envelope deliveries Project-specific designed steel trusses are a cost and material efficient solution, especially for long span buildings	Remember	CO 2	CLO 7	ACE016.07
9	What is multi storey framed structure?	Multi-storey steel frame structure consist of beams and columns from welded H-shaped steel, hot-rolled H-shaped steel.	Remember	CO 2	CLO 7	ACE016.07
10	Define trusses.	A Truss is a structure composed of slender members (two-force members) joined together at their end points. Joints are modeled by smooth pin connections. What is the purpose of a truss? The purpose of a truss is to distribute the load through all the members.	Remember	CO 2	CLO 7	ACE016.07
11	Define Trussed Beam.	A beam strengthened by providing ties and struts is known as Trussed Beams.	Remember	CO 2	CLO 7	ACE016.07
12	What is meant by thermal stresses?	Thermal stresses are stresses developed in a structure/member due to change in temperature. Normally, determine structures do not develop thermal stresses. They can absorb changes in lengths and consequent displacements without developing stresses.	Remember	CO 2	CLO 7	ACE016.07
13	What is the effect of temperature on the members of a statically determinate plane truss.	In determinate structures temperature changes do not create any internal stresses. The changes in lengths of members may result in displacement of joints. But these would not result in internal stresses or changes in external reactions.	Remember	CO 2	CLO 7	ACE016.07
14	What Is Stability?	The stability may be defined as an ability of a material to withstand high load without deformation.	Remember	CO 2	CLO 7	ACE016.07
15	Where does maximum deflection occur in a beam?	Generally maximum deflection occurs at the middle of the load for uniformly distributed load. However, when there is point load it varies. Depending on the location of the point load and location it may vary.	Remember	CO 2	CLO 7	ACE016.07
UNIT-III						
1	What is a retaining wall?	A retaining wall is a structure designed and constructed to resist the lateral pressure of soil, when there is a desired change in ground elevation that exceeds the angle of repose of the soil.	Understand	CO 3	CLO 13	ACE016.13

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2	What is a basement wall?	A basement wall is thus one kind of retaining wall.	Remember	CO 3	CLO 13	ACE016.13
3	What is considered a retaining wall?	A retaining wall is a structure that holds or retains soil behind it. There are many types of materials that can be used to create retaining walls like concrete blocks, poured concrete, treated timbers, rocks or boulders. Some are easy to use, others have a shorter life span, but all can retain soil.	Remember	CO 3	CLO 13	ACE016.13
4	What are the types of retaining wall?	Cantilever Retaining Walls Counterfort Retaining Walls Gravity Poured Concrete Retaining Walls Semi-Gravity Retaining Walls	Remember	CO 3	CLO 13	ACE016.13
5	Why are retaining walls important?	Retaining walls are meant to hold the soil, on a slope, without it eroding.	Remember	CO 3	CLO 13	ACE016.13
6	What are the forces acting on a retaining wall?	Lateral forces: Earth pressure due to backfill and surcharge. Vertical forces: Acting downwards: Self weight of the retaining wall ; Weight of soil above heel slab. Acting upwards: Force due to soil pressure underneath the base slab.	Understand	CO 3	CLO 13	ACE016.13
7	What is Counterfort retaining wall?	In retaining wall. A counterfort retaining wall is a cantilever wall with counterforts, or buttresses, attached to the inside face of the wall to further resist lateral thrust. Some common materials used for retaining walls are treated lumber, concrete block systems, poured concrete, stone, and brick.	Remember	CO 3	CLO 15	ACE016.15
8	What is active earth pressure?	Active earth pressure is the one that is exerted by the soil that tends to overturn or slide the retaining wall.	Understand	CO 3	CLO 13	ACE016.13
9	What is stability of retaining wall?	The safety factor of wall stability against overturning is defined as the ratio between the sum of resisting moments and the sum of overturning moments.	Remember	CO 3	CLO 13	ACE016.13
10	What is a water tank?	A water tank is a container for storing water. Water tanks are used to provide storage of water for use in many applications, drinking water, irrigation agriculture, fire suppression, agricultural farming, both for plants and livestock, chemical manufacturing, food preparation as well as many other uses.	Remember	CO 3	CLO 13	ACE016.13

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11	What is the IS code for water tank design?	The Elevated tanks are supported by properly designed staging. The codes that are used for water tank design is IS: 3370. The different parts of the code is mentioned along with the respective sections dealt.	Remember	CO 3	CLO 13	ACE016.13
12	What is RCC water tank?	Reinforced concrete water tanks are constructed for storing water. The design of reinforced concrete water tank is based on IS 3370: 2009 (Parts I – IV)	Remember	CO 3	CLO 13	ACE016.13
13	What is the best material for a water tank?	Plastic tanks. The most common plastic tanks are made of polyethylene, often just called 'poly' Aquaplate and galvanised steel. Stainless steel. Concrete. Fiberglass.	Remember	CO 3	CLO 15	ACE016.15
14	What is meant by surcharge in civil engineering?	Surcharge refers to the vertical pressure or any load that acts over the ground surface. It is called as surcharge load.	Remember	CO 3	CLO 15	ACE016.15
15	What is difference between active and passive earth pressure?	While the passive pressure will not 'respond', until it is 'attacked' by wall pushed by active pressure. Active earth pressure is the one that is exerted by the soil that tends to overturn or slide the retaining wall. Passive earth pressure is the one exerted from the other side and that tends to stabilize it.	Remember	CO 3	CLO 13	ACE016.13
UNIT-IV						
1	How to estimate the design loads in limit state method?	In limit state method, Design loads = Characteristic loads multiplied by the partial safety factor for loads	Remember	CO 4	CLO 16	ACE016.16
2	How to estimate the design loads in working stress method?	In working stress method, Design loads = Characteristic loads.	Remember	CO 4	CLO 16	ACE016.16
3	Write a short note on limit state of durability.	The acceptable limit for safety and serviceability requirements before failure occurs is called a limit state. The aim of design is to achieve acceptable probabilities that the structure will not become unfit for the use for which it is intended, that is, that it will not reach a limit state.	Remember	CO 4	CLO 16	ACE016.16

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4	What is partial safety factor?	Factors of safety (FoS), also known as (and used interchangeably with) safety factor (SF), is a term describing the load carrying capacity of a system beyond the expected or actual loads. Essentially, the factor of safety is how much stronger the system is than it usually needs to be for an intended load.	Remember	CO 4	CLO 16	ACE016.16
5	Write any two assumptions are made in elastic theory methods.	The following are the assumptions made in working stress method: a) At any cross-section, plane sections before bending remain plain after bending b) All tensile stresses are taken up by reinforcement and none by concrete, except as otherwise specifically permitted	Remember	CO 4	CLO 16	ACE016.16
6	What is the minimum thickness of slab?	The minimum thickness of slab used in RCC construction is 150mm . But it varies depending upon the type of slab to be used.	Remember	CO 4	CLO 16	ACE016.16
7	What is slab structure?	A slab is a structural element, usually made up of reinforced concrete. They help in transferring the loads further to beams.	Remember	CO 4	CLO 16	ACE016.16
8	What is the value of minimum reinforcement in a slab?	Minimum reinforcement is 0.12% for HYSD bars and 0.15% for mild steel bars. The diameter of bar generally used in slabs are: 6 mm, 8 mm, 10 mm, 12mm and 16mm. The maximum diameter of bar used in slab should not exceed 1/8 of the total thickness of slab.	Remember	CO 4	CLO 16	ACE016.16
9	Why slabs are not designed for shear?	Shear reinforcement is usually not required in slabs supported on beams or walls because the depth is small and the span therefore fairly slender so bending and deflection will nearly always govern the design.	Remember	CO 4	CLO 16	ACE016.16
10	What is a two way concrete slab?	When a reinforced concrete slab is supported by beams on all the four sides and the loads are carried to the supports along both directions, it is known as two way slab. In two way slab the ratio of longer span (l) to shorter span (b) is less than 2.	Remember	CO 4	CLO 17	ACE016.17
11	What type of concrete is used for slabs?	A concrete mix of 1 part cement : 2 parts sand : 4 parts coarse aggregate should be used for a concrete slab.	Remember	CO 4	CLO 16	ACE016.16

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12	What is the use of crank bar in slab?	Bent-up bars or known as Crank bars. Which we provide in the ends on the top of the slab or also in the top of the mid supports (if any type of mid-support is present) to counter the negative moment called (Hogging) which produce at that sections of the slabs and beams.	Remember	CO 4	CLO 17	ACE016.17
13	What is negative bar in slab?	Positive slabs are usually provided on the lower side of the slab and negative on the upper. We should know that, positive oment bars (lower bars) resist maximum moment in between the to adjacent columns, so the lap between the two steel bars should never be provided at that point that is mid.	Remember	CO 4	CLO 17	ACE016.17
14	Where is isolated footing used?	Pad/Isolated Footing. Isolated footings (also known as Pad or Spread footings) are commonly used for shallow foundations in order to carry and spread concentrated loads, caused for example by columns or pillars. Isolated footings can consist either of reinforced or non-reinforced material.	Remember	CO 4	CLO 16	ACE016.16
15	What is eccentric footing?	An eccentric footing is more economical than a combined footing when the allowable soil pressure is relatively high and distance between the columns is large. A spread or wall footing that also must resist a moment in addition to the axial column.	Remember	CO 4	CLO 17	ACE016.17
UNIT-V						
1	How to estimate the design loads in working stress method?	In working stress method, Design loads = Characteristic loads.	Remember	CO 5	CLO 19	ACE016.19
2	Write a short note on limit state of durability.	The acceptable limit for safety and serviceability requirements before failure occurs is called a limit state. The aim of design is to achieve acceptable probabilities that the structure will not become unfit for the use for which it is intended, that is, that it will not reach a limit state.	Remember	CO 5	CLO 20	ACE016.20

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3	What is partial safety factor?	Factors of safety (FoS), also known as (and used interchangeably with) safety factor (SF), is a term describing the load carrying capacity of a system beyond the expected or actual loads. Essentially, the factor of safety is how much stronger the system is than it usually needs to be for an intended load.	Remember	CO 5	CLO 19	ACE016.19
4	Write any two advantages of limit state over other methods.	<ul style="list-style-type: none"> Hence the design by limit state method is found to be more economical. In the limit state method of analysis, the principles of both elastic as well as plastic theories used and hence suitable for concrete structures 	Remember	CO 5	CLO20	ACE016.20
5	What is meant by balanced section?	When the maximum stress in steel and concrete simultaneously reach their allowable values, the section is said to be balanced section. In this section the actual neutral axis depth is equal to the critical neutral axis.	Understand	CO 5	CLO 19	ACE016.19
6	what is chimney	A chimney is an architectural ventilation structure made of masonry, clay or metal that isolates hot toxic exhaust gases or smoke produced by a boiler, stove, furnace, incinerator or fireplace from human living areas.	Understand	CO 5	CLO20	ACE016.20
7	What is the purpose of a chimney?	Think of a chimney and the flue within it as a structure built to protect you. That is an important function of all chimneys no matter what kind of appliance or fireplace they serve.	Understand	CO 5	CLO20	ACE016.20
8	What are the types of Steel Chimney Structure	Self-supporting steel chimneys Guyed steel chimneys.	Understand	CO 5	CLO 19	ACE016.19
9	What are the factors considered for selection of steel chimney?	Cost effectiveness Number of units, equipment type, and fuel type to be used. If chimney used for boilers, consider surface area, output efficiency, draft requirements. Equipment operation mode flue gas temperature before entering the chimney and its variation. Specific weight, dust quantity, and data about flue gas aggressiveness.	Understand	CO 5	CLO 19	ACE016.19

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10	What are bunkers in structure?	Bunkers are Shallow structures in which the plane of rupture of the stored material meets the top horizontal surface of the material before meeting the opposite sides of the structure.	Remember	CO 5	CLO 19	ACE016.19
11	Difference Between Bunker and Silo?	Silos are structures built for storing different materials. On the other hand, Bunkers are underground dwellings, normally used in war. Bunkers are shallow structures. Silos are tall structures.	Remember	CO 5	CLO 19	ACE016.19
12	What are bunkers made of?	Trench bunkers are small concrete structures, partly dug into the ground. Many artillery installations, especially for coastal artillery, have historically been protected by extensive bunker systems.	Remember	CO 5	CLO 19	ACE016.19
13	With what material silos and bunkers are made up of?	The bunkers and silos made of reinforced concrete have almost replaced the steel storage structures. Concrete bins possess less maintenance and other architectural qualities greater than steel storage tanks.	Remember	CO 5	CLO 19	ACE016.19
14	What are the main structural elements that constitutes a bunker	Vertical walls Hopper Bottom Edge Beam (At the top level) Supporting Columns	Remember	CO 5	CLO 19	ACE016.19
15	What is angle of rupture of material in buker?	The angle of rupture of the material in case of bunkers, will meet the horizontal surface at the top of the bin, before it touches the opposite side walls of the structure	Remember	CO 5	CLO 19	ACE016.19

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