



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

CIVIL ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	DESIGN OF STEEL STRUCTURES AND DRAWING
Course Code	:	ACE012
Program	:	B.Tech
Semester	:	VI
Branch	:	CivilEngineering
Section	:	A& B
Course Faculty	:	Dr. Venu M, Professor Dr. Vamsi Mohan U, Professor

COURSE OBJECTIVES:

The course should enable the students to:	
I	Discuss the concepts of structural steel design conforming to the IS 800 design code.
II	Identify various types of structural steel and its properties also define concepts of Limit State Design.
III	Analyse structures using plastic method of analysis and evaluate collapse load and plastic moment capacity
IV	Design compression members, beams, connections and girders.

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
UNIT-I						
1	What is a Buckling?	Buckling is defined as a mode of failure under compression of a structural component that is thin with respect to its length (slenderness).	Understand	CO1	CLO1	ACE012.01
2	What is plasticity?	Property of material to be deformed repeatedly without rupture by the action of a force, and remain deformed after the force is removed.	Remember	CO1	CLO2	ACE012.02
3	What is limit state method of collapse and serviceability?	A structure designed by employing limit state method of collapse and checked for other limit states will ensure the strength and stability requirements at the collapse under the design loads and also deflection and cracking at the limit state of serviceability.	Understand	CO1	CLO3	ACE012.03

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
4	What is joint efficiency?	A numerical value expressed as the ratio of the strength of a riveted, welded, or brazed joint to the strength of the parent metal.	Remember	CO1	CLO2	ACE012.02
5	How is welding thickness calculated?	For a deep penetration weld, the depth of penetration should be a minimum of 2.4 mm. Then the size of the weld is minimum leg length plus 2.4 mm. The size of a fillet weld should not be less than 3 mm or more than the thickness of the thinner part joined.	Understand	CO1	CLO4	ACE012.04
6	What is efficiency of riveted joint?	The strength of a rivet joint is measured by its efficiency. The efficiency of a joints defined as the ratio between the strength of a riveted joint to the strength of an unriveted joints or a solid plate.	Remember	CO1	CLO5	ACE012.05
7	Why fillet weld is commonly used?	Fillet welding refers to the process of joining two pieces of metal together whether they be perpendicular or at an angle. These welds are commonly referred to as Tee joints which are two pieces of metal perpendicular to each other or Lap joints which are two pieces of metal that overlap and are welded at the edges.	Understand	CO1	CLO8	ACE012.08
8	Are welds stronger in shear or tension?	For equal leg lengths, making the direction of applied tension nearly parallel to the throat leads to a large reduction in strength. The optimum weld shape recommended is to provide shear leg ≤ 3 times the tension leg. ... In general, fillet welds are stronger in compression than in tension.	Remember	CO1	CLO7	ACE012.07
9	What is eccentric riveted joint?	Procedure for designing riveted joint under eccentric loading. In many applications, a machine member is subjected to load such that a bending moment is developed in addition to direct normal or shear loading. Such type of loading is commonly known as eccentric loading.	Understand	CO1	CLO9	ACE012.09
10	What is a 6mm fillet weld?	Fillet welding refers to the process of joining two pieces of metal together whether they be perpendicular or at an angle. These welds are commonly referred to as Tee joints which are two pieces of metal	Understand	CO1	CLO10	ACE012.10

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		perpendicular to each other or Lap joints which are two pieces of metal that overlap and are welded at the edges.				
11	Why weld joint are preferred over riveted joints?	This is due to the reason, that in welding, gussets or other connecting components are not used. The welded joints provide high efficiency, which is not possible in the case of riveted joints. Alterations and additions can be made easily in the existing structures. A welded joint has a great strength	Remember	CO1	CLO11	ACE012.11
12	What is bolted connection?	Bolted joints are one of the most common elements in construction and machine design. They consist of fasteners that capture and join other parts, and are secured with the mating of screw threads. There are two main types of bolted joint designs: tension joints and shear joints.	Understand	CO1	CLO11	ACE012.11
13	What are the advantages and disadvantages of welded joints?	Disadvantages of Welding Joints. Welded joints are more brittle and therefore their fatigue strength is less than the members joined. Due to uneven heating & cooling of the members during the welding, the members may distort resulting in additional stresses.	Understand	CO1	CLO10	ACE012.10
14	How many types of welding joints are there?	There are five different types of welded joints for bringing two parts together for joining. Five types of welded joints are butt joint, corner joint, lap joint, tee-joint and edge joint	Remember	CO1	CLO11	ACE012.11
15	What is a bearing type connection?	Slip-critical joint, from structural engineering, is a type of bolted structural steel connection which relies on friction between the two connected elements rather than bolt shear or bolt bearing to join two structural elements	Understand	CO1	CLO11	ACE012.11
UNIT-II						
1	What are tension and compression members?	Tension members are linear members in which axial forces act so as to elongate (stretch) the member. ... Tension members carry loads most efficiently, since the entire cross section is subjected to uniform stress. Unlike compression members,	Understand	CO2	CLO12	ACE012.12

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		they do not fail by buckling (see chapter on compression members).				
2	What is meant by compression member?	Compression members are structural elements that are pushed together or carry a load, more technically they are subjected only to axial compressive forces.	Remember	CO2	CLO12	ACE012.12
3	What is slenderness ratio of a compression member?	Explanation: The tendency of member to buckle is usually measured by its slenderness ratio. Slenderness ratio of member is ratio of effective length to appropriate radius of gyration ($\lambda = KL/r$).	Understand	CO2	CLO12	ACE012.12
4	What is lacing in steel structures?	Built-up columns are widely used in steel construction especially when the effective lengths are great and the compression forces light. They are composed of two or more parallel main components interconnected by lacing or batten plates (Figures 1 and 2). ... the internal forces in the connecting members.	Remember	CO2	CLO13	ACE012.13
5	What's the difference between tension and compression?	Main Difference – Tension vs. Compression. Tension and compression refer to forces that attempt to deform an object. The main difference between tension and compression is that tension refers to forces that attempt to elongate a body, whereas compression refers to forces that attempt to shorten the body.	Understand	CO2	CLO13	ACE012.13
6	What is compression structure?	In mechanics, compression is the application of balanced inward ("pushing") forces to different points on a material or structure, that is, forces with no net sum or torque directed so as to reduce its size in one or more directions.	Understand	CO2	CLO13	ACE012.13
7	Is beam a tension member?	For example a beam is essentially a tension member. A rule of thumb is that members which has longer span in the X-axis are tension member. ... Tension members are structural elements that are subjected to axial tensile forces.	Remember	CO2	CLO14	ACE012.14
8	What is Batten in steel structure?	A batten is most commonly a strip of solid material, historically wood but can also of plastic, metal, or	Understand	CO2	CLO13	ACE012.13

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		fiberglass. Battens are variously used in construction, sailing, and other fields. ... In the steel industry, battens used as furring may also be referred to as "top hats", in reference to the profile of the metal.				
9	What is imperfection factor?	Imperfection Factor. The generalized imperfection factor takes into account all the relevant defects in a real column when considering buckling: geometric imperfections, eccentricity of applied loads and residual stresses; inelastic properties are not considered because they only influence stub columns.	Remember	CO2	CLO13	ACE012.13
10	What is slenderness ratio in steel?	Slenderness ratio is the ratio of the length of a column and the least radius of gyration of its cross section. Often denoted by λ . It is used extensively for finding out the design load as well as in classifying various columns in short/intermediate/long. Example- short Steel column - λ is less than 50.	Understand	CO2	CLO13	ACE012.13
11	What does radius of gyration mean?	Radius of gyration or gyradius of a body about an axis of rotation is defined as the radial distance of a point from the axis of rotation at which, if whole mass of the body is assumed to be concentrated, its moment of inertia about the given axis would be the same as with its actual distribution of mass.	Remember	CO2	CLO14	ACE012.14
12	What is the main purpose of lacings and battens?	The main difference is in the purpose for which they are provided-Lacing flats carry no force but their sole purpose is to prevent buckling of column while Battens along with to check buckling plays a role in force transfer.	Understand	CO2	CLO12	ACE012.12
13	What is battened column?	Lacings, battens or perforated plates. These members are frequently used as light compression members, such as struts in truss moment frames and as columns of light steel structures. Double-channel sections. are often used as built-up columns, which are connected to each other at few places by means of battens.	Remember	CO2	CLO14	ACE012.14

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
14	What is a built up column?	Built-up columns are widely used in steel construction especially when the effective lengths are great and the compression forces light. They are composed of two or more parallel main components interconnected by lacing or batten plates	Understand	CO1	CLO14	ACE012.14
15	What is the opposite of compression?	The answer lies in how each bridge type deals with the important forces of compression and tension. ... That's right, you compress it, and by squishing it, you shorten its length. Compressional stress, therefore, is the opposite of tensional stress.	Remember	CO2	CLO14	ACE012.14
UNIT-III						
1	How do you calculate beam size?	Determine the beam / header span (length) and the span carried (supported) by the beam / header. Click on the appropriate beam, this will take you to the calculation table for your project. The column on the left of each chart labeled BEAM SPAN represents the beam length (with bearing) required for your project	Understand	CO3	CLO15	ACE012.15
2	Why do we use I Beam?	The reason an I section is used in beam design is because a beam resists bending. When a beam bends, the lower most part of it is in tension, and the uppermost is in compression. Simply, its flange carries bending while the web carry the shear. We can have large spans with lesser weight of material due its shape.	Remember	CO3	CLO16	ACE012.16
3	What is Moment capacity?	The moment capacity is maximum bending moment that can be resisted by an element before it fails in bending.	Understand	CO3	CLO16	ACE012.16
4	How far can beams span?	2 grade, there is a method that can be used for estimating beam spans for a preliminary design. When supporting joists that span 12 feet with no overhang beyond the beam, a double ply beam can span in feet a value equal to its depth in inches. A double 2x12 beam can span 12 feet; a (2) 2x10 can span 10 feet and so on.	Remember	CO3	CLO17	ACE012.17
5	Why are beams stronger?	A higher section modulus means a lower resultant stress in	Understand	CO3	CLO16	ACE012.16

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		the beam from any given bending moment M . The section modulus for an I-beam, when compared to a solid rectangular beam of the same cross-sectional area is much higher. This is because more fibers are distributed away from the neutral axis.				
6	What are steel I beams used for?	Structural steel is most often used in the construction industry in the form of structural beams. They provide structural support to buildings, while the web of the beam provides resistance to shear forces, such as breaking, tearing apart, or collapsing the flange resists bending of the section.	Understand	CO3	CLO16	ACE012.16
7	What are the different types of beams?	The four different types of beams are: • Simply Supported Beam. • Fixed Beam. • Cantilever Beam. • Continuously Supported Beam.	Remember	CO3	CLO17	ACE012.17
8	What is the difference between moment and bending moment?	A bending moment is the reaction induced in a structural element when an external force or moment is applied to the element causing the element to bend. The most common or simplest structural element subjected to bending moments is the beam. For example a beam which is simply supported at both ends.	Understand	CO3	CLO18	ACE012.18
9	How far can a steel beam span without support?	(If a steel girder must span 24 feet between columns, it should be at least 18" deep.) All other things being equal, a deeper wide-flange beam will be more economical than a shallower one. There are exceptions to this rule, but it is generally correct.	Understand	CO3	CLO18	ACE012.18
10	Why are girders given I shape?	I beam have very high moment of inertia for the same volume of the given material. ... The two horizontal parts (called flanges) of the I beam can bear high bending and shearing stress. That means they do not get twisted and tilted easily. That is why they are used in girders, and as rails on the railway tracks.	Remember	CO3	CLO16	ACE012.16

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
11	What is the difference between an I beam and an H beam?	It gets its name because it looks like a capital H over its cross section. The H-beam has wider flanges than an I-beam, but the I-beam has tapered edges. The width is the flange, and the height is the Web. The difference between both H-beams and I-beams is the flange by web ratio.	Understand	CO3	CLO15	ACE012.15
12	What is the difference between a wide flange beam and an M beam?	It gets its name because it looks like a capital H over its cross section. The H-beam has wider flanges than an I-beam, but the I-beam has tapered edges. The width is the flange, and the height is the Web. The difference between both H-beams and I-beams is the flange by web ratio.	Remember	CO3	CLO17	ACE012.17
13	What are the types of structural steel?	Two types of Steel Structure are: Structural steel connections and Structural steel Beam and Columns. KP Engineering Works Ltd is a larger manufacturing Structural Steel Beams, Columns, PFCs and Structures with the latest technology involved in manufacturing.	Understand	CO3	CLO18	ACE012.18
14	How many types of beams are there in construction?	21 Types of Beams in Construction. Different types of beams are used in construction of building and structures. These are horizontal structural element that withstand vertical loads, shear forces and bending moments.	Understand	CO3	CLO18	ACE012.18
15	What are beams and columns in a structure?	Generally, a vertical member of a structure that resists axial/eccentric load is called column. carries load parallel to longitudinal axis. carries load transferred by beam and ultimately transfer it to footing and ground. For framed structures, column is an essential element of a structure.	Remember	CO3	CLO18	ACE012.18
UNIT-IV						
1	What is eccentric connection?	Eccentric connections • If the force applied does not passes through the CG of the joint then such joint carries moment in addition to an axial direct force. Such types of connections are called as eccentric connections	Understand	CO4	CLO19	ACE012.19
2	What is an eccentric riveted	Procedure for designing riveted joint under eccentric loading. In	Remember	CO4	CLO20	ACE012.20

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
	joint?	many applications, a machine member is subjected to load such that a. bending moment is developed in addition to direct normal or shear loading. Such. type of loading is commonly known as eccentric loading.				
3	What is a splice connection?	Splice connections allow connecting two collinear elements using additional plates on webs and/or flanges. They can be standalone elements or elements of a structure.	Understand	CO4	CLO19	ACE012.19
4	What is bracket in civil engineering?	A corbel and console are types of brackets. In mechanical engineering a bracket any intermediate component for fixing one part to another, usually larger, part. What makes a bracket a bracket is that it is intermediate between the two and fixes the one to the other.	Remember	CO4	CLO19	ACE012.19
5	What is a beam splice?	Beam splices typically resist large bending moments and shear forces. If a rolled section beam splice is located away from the point of maximum moment, it is usually assumed that the flange splice carries all the moment and the web splice carries the shear.	Understand	CO4	CLO19	ACE012.19
6	What are splice plates?	A splice plate is a component of the railway track. It is a piece of metal bolted onto the rails, making it possible to connect two rails in a row. Splice plates are often used near switches or other sensitive areas. Elsewhere on the track the joint between two rails is generally welded.	Understand	CO4	CLO20	ACE012.20
7	What is wall bracket?	A bracket is an architectural element: a structural or decorative member. It can be made of wood, stone, plaster, metal, or other mediums. It projects from a wall, usually to carry weight and sometimes to "...strengthen an angle". A corbel and console are types of brackets.	Remember	CO4	CLO20	ACE012.20
8	What is column splice?	A column splice means the joining of two parts of a column whereas a column base transfers forces and moments at the lower end of a column to a foundation.	Understand	CO4	CLO19	ACE012.19
9	What is flange splice?	Beam splices typically resist large bending moments and	Remember	CO4	CLO20	ACE012.20

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		shear forces. If a rolled section beam splice is located away from the point of maximum moment, it is usually assumed that the flange splice carries all the moment and the web splice carries the shear.				
10	What is splice in steel structure?	A splice joint is a method of joining two members end to end in woodworking. ...Splice joints are stronger than unenforced butt joints and have the potential to be stronger than a scarf joint. Splices are therefore most often used when structural elements are required in longer lengths than the available material.	Understand	CO4	CLO19	ACE012.19
11	What is Moment connection in steel?	MOMENT CONNECTIONS. Moment connections are designed to transfer bending moments, shear forces and sometimes normal forces. The design strength and stiffness of a moment connection are defined in relation to the strength and stiffness of the connected members	Remember	CO4	CLO19	ACE012.19
12	What is the difference between moment connection and shear connection?	A moment connection transfers bending moments from a beam to a column. It is a stiff connection. A shear connection (also called a simple connection) transfers little or no moment. An example of a moment connection is a fully welded endplate to a beam, connected to a column flange.	Understand	CO4	CLO19	ACE012.19
13	How do gusset plates work?	Gusset plate is a plate for connecting beams and girders to columns. A gusset plate can be fastened to a permanent member either by bolts, rivets or welding or a combination of the three. Gusset plates not only serve as a method of joining steel members together, but also strengthen the joint.	Understand	CO4	CLO20	ACE012.20
14	What are stiffeners?	Stiffeners are secondary plates or sections which are attached to beam webs or flanges to stiffen them against out of plane deformations. Almost all main bridge beams will have stiffeners. However, most will only have transverse web stiffeners, i.e.	Remember	CO4	CLO20	ACE012.20

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		vertical stiffeners attached to the web.				
15	What is stiffened seat connection?	In multistory braced frame construction, the connection of choice for simple connections between beams and column webs is the seated connection. ... But in more heavily loaded connections, a stiffened seat is frequently used to support the beam reaction.	Understand	CO4	CLO20	ACE012.20
UNIT-V						
1	What is welded plate girder?	In a plate girder bridge, the plate girders are typically I-beams made up from separate structural steel plates (rather than rolled as a single cross-section), which are welded or, in older bridges, bolted or riveted together to form the vertical web and horizontal flanges of the beam.	Understand	CO5	CLO21	ACE012.21
2	Why plate girders are used?	It is made up from separate structural steel plates, which are welded or, in older bridges, bolted or riveted together. They form the vertical web and horizontal flanges of the girder. The gantry girder is a long steel beam that can carry heavy loads, especially moving loads. They are used at construction sites.	Remember	CO5	CLO21	ACE012.21
3	What is the difference between beam and girder?	The main difference between a girder and a beam is the size of the component. In general, workers in the construction industry refer to large beams as girders. ... If it is the chief horizontal support in a structure, it is a girder, not a beam. If it is one of the smaller structural supports, it is a beam.	Understand	CO5	CLO21	ACE012.21
4	What is a girder used for?	A girder is a support beam used in construction. It is the main horizontal support of a structure which supports smaller beams. Girders often have an I-beam cross section composed of two load-bearing flanges separated by a stabilizing web, but may also have a box shape, Z shape, or other forms.	Remember	CO5	CLO22	ACE012.22
5	What is cross girder?	A girder is a support beam used in construction. It is the main	Understand	CO5	CLO22	ACE012.22

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		horizontal support of a structure which supports smaller beams. Girders often have an I-beam cross section composed of two load-bearing flanges separated by a stabilizing web, but may also have a box shape, Z shape, or other forms.				
6	How many types of girders are there?	Types of Bridges - Arch, Girder, Cable, Truss, Rigid Frame. Below is the list of 5 main types of bridges based on support mechanism: Girder bridges. Arch bridges.	Understand	CO5	CLO23	ACE012.23
7	Why are girders given I shape?	I beam have very high moment of inertia for the same volume of the given material. The two horizontal parts (called flanges) of the I beam can bear high bending and shearing stress. That means they do not get twisted and tilted easily. That is why they are used in girders, and as rails on the railway tracks.	Remember	CO5	CLO23	ACE012.23
8	What are plate girders where are they used?	It is made up from separate structural steel plates, which are welded or, in older bridges, bolted or riveted together. They form the vertical web and horizontal flanges of the girder. The gantry girder is a long steel beam that can carry heavy loads, especially moving loads. They are used at construction sites.	Understand	CO5	CLO22	ACE012.22
9	What is stiffener plate?	Stiffeners are secondary plates or sections which are attached to beam webs or flanges to stiffen them against out of plane deformations. ... Deep beams sometimes also have longitudinal web stiffeners.	Remember	CO5	CLO22	ACE012.22
10	How does a girder bridge work?	In its most basic form, a beam bridge consists of a horizontal beam that is supported at each end by piers. The weight of the beam pushes straight down on the piers. Under load, the beam's top surface is pushed down or compressed while the bottom edge is stretched or placed under tension.	Understand	CO5	CLO23	ACE012.23
11	What is a girder on a deck?	A girder, cantilevered or drop beam is a structural member positioned below the joists to support the weight of the frame. Cantilevered beams are stronger	Remember	CO5	CLO23	ACE012.23

S.No	QUESTION	ANSWER	Blooms Level	CO	CLO	CLO Code
		than flush style beams because they rely on the strength properties of the wood rather than the individual mechanical and fastener connections.				
12	What are the ends of a bridge called?	The area immediately adjacent to the end of a bridge. Abutment comes to mind. From Wikipedia: In engineering, abutment refers to the substructure at the ends of a bridge span or dam whereon the structure's superstructure rests or contacts.	Understand	CO5	CLO23	ACE012.23
13	What is gantry girder?	Gantry girders are laterally unsupported beams to carry heavy loads from place to place at the construction sites, mostly these are of steel material. A girder is a support beam used in construction. It is the main horizontal support of a structure which supports smaller beams.	Understand	CO5	CLO23	ACE012.23
14	What do you mean by plate girder?	In a plate girder bridge, the plate girders are typically I-beams made up from separate structural steel plates (rather than rolled as a single cross-section), which are welded or, in older bridges, bolted or riveted together to form the vertical web and horizontal flanges of the beam.	Remember	CO5	CLO22	ACE012.23
15	What is buckling or crippling load?	Crippling is just like buckling, but it happens in the web of a beam when it is being compressed. It often occurs at the supports of a beam, where the bottom flange is resting on a support, and the top flange is holding up the load, such as on a bridge abutment.	Understand	CO5	CLO23	ACE012.23

Signature of the Faculty

HOD,CE