# BRAINWARE UNIVERSITY

**Term End Examination 2021 - 22**
**Programme – Diploma in Civil Engineering**
**Course Name – Design of Steel Structures**
**Course Code - DCE601**
**( Semester VI )**

**Time allotted : 1 Hrs.15 Min.**                                **Full Marks : 60**

[The figure in the margin indicates full marks.]

**Group-A**

(Multiple Choice Type Question)                                1 x 60=60

*Choose the correct alternative from the following :*

(1) The heaviest I-section for same depth is

  a) ISMB                               b) ISLB

  c) ISHB                               d) ISWB

(2) If the thickness of thinnest outside plate is 10 mm, then the maximum pitch of rivetsin tension will be taken as

  a) 120 mm                          b) 160 mm

  c) 200 mm                          d) 300 mm

(3) In a gusseted base, when the end of the column is machined for complete bearing onthe base plate, then the axial load is assumed to be transferred to base plate

  a) fully by direct bearing                 b) fully through fastenings

  c) 50% by direct bearing and 50% through fastenings       d) 75% by direct bearing and 25% through fastenings

(4) When the axis of load lies in the plane of rivet group, then the rivets are subjected to

  a) only shear stresses                   b) only tensile stresses

  c) both (a) and (b)                      d) none of the above

(5) The difference between gross diameter and nominal diameter for the rivets up to 25mm diameter is

  a) 1.0 mm                          b) 1.5 mm

  c) 2.0 mm                          d) 2.5 mm

(6) As compared to field rivets, the shop rivets are

  a) stronger                           b) weaker

  c) equally strong                     d) any of the above

(7) If the thickness of plate to be connected by a rivet is 16 mm, then suitable size ofrivet as per Unwin's formula will be

a) 16 mm

b) 20 mm

c) 24 mm

d) 27 mm

(8) Minimum pitch of the rivets shall not be less than ………. (where d is gross diameter of rivet)

a) 1.5 d

b) 2.0 d

c) 2.5 d

d) 3.0 d

(9) Select the correct statement

a) Material cost of a rivet is higher than that of a bolt.

b) Tensile strength of a bolt is lesser than that of a rivet.

c) Bolts are used as a temporary fastenings whereas rivets are used as permanent fastenings.

d)
Riveting is less noisy than bolting.

(10) Bolts are most suitable to carry

a) shear

b) bending

c) axial tension

d) shear and bending

(11) Diameter of a bolt hole is usually taken as

a) gross diameter of bolt

b) nominal diameter + 1.5 mm

c) nominal diameter + 2.0 mm

d) nominal diameter of bolt

(12) In the cross-section of a weld, throat is the

a) minimum dimension

b) average dimension

c) maximum dimension

d) none of the above

(13) A butt weld is specified by

a) effective throat thickness

b) plate thickness

c) size of weld

d) penetration thickness

(14) The actual thickness of butt weld as compared to the thickness of plate is usually

a) more

b) less

c) equal

d) none of the above

(15) According to IS Specifications, the maximum pitch of rivets in compression is ……….
(where t is thickness of thinnest outside plate or angle)

a) lesser of 200 mm and 12 t

b) lesser of 200 mm and 161

c) lesser of 300 mm and 32 t

d) lesser of 3 00 mm and 24 t

(16) The slenderness ratio of a column supported throughout its length by a masonrywall is

a) zero

b) 10

c) 100

d) infinity

(17) The effective length of a battened strut effectively held in position at both ends butnot restrained in direction is taken as

a) 1.8 L

b) L

c) 1.1 L

d) 1.5 L

(18) The maximum slenderness ratio of a compression member carrying both dead andsuperimposed load is

a) 180

b) 200

c) 250

d) 350

(19) The maximum slenderness ratio of a steel column, the design of which is governedby wind or seismic forces is

a) 150

b) 180

c) 250

d) 350

(20) The best arrangement to provide unified behaviour in built up steel columns is by

a) lacing

b) battening

c) tie plates

d) perforated cover plates

(21) The use of tie plates in laced columns is

a) prohibited

b) not prohibited

c) permitted at start and end of lacing system only

d) permitted between two parts of the lacing

(22) Lacing bars in a steel column should be designed to resist

a) bending moment due to 2.5% of the column load

b) shear force due to 2.5% of the column load

c) 2.5% of the column load

d) none of the above

(23) Angle of inclination of the lacing bar with the longitudinal axis of the columnshould preferably be between

a) 10° to 30°

b) 30° to 40°

c) 40° to 70°

d) 90°

(24) The effective length of a battened column is increased by

a) 0.05

b) 0.1

c) 0.15

d) 0.2

(25) The slenderness ratio of lacing bars should not exceed

a) 100

b) 120

c) 145

d) 180

(26) Economical depth of a plate girder corresponds to

a) minimum weight

b) minimum depth

c) maximum weight

d) minimum thickness of web

(27) Shear buckling of web in a plate girder is prevented by using

a) vertical intermediate stiffener

b) horizontal stiffener at neutral axis

c) bearing stiffener

d) none of the above

(28) Minimum thickness of web in a plate girder, when the plate is accessible and alsoexposed to weather, is

a) 5 mm

b) 6 mm

c) 8 mm

d) 10 mm

(29) As per IS : 800, for compression flange, the outstand of flange plates should notexceed (where t = thickness of thinnest flange plate)

a) 121

b) 161

c) 201

d) 251

(30) Bearing stiffener in a plate girder is used to

a) transfer the load from the top flange to the bottom one

b) prevent buckling of web

c) decrease the effective depth of web

d) prevent excessive deflection

(31) Gantry girders are designed to resist

    a) lateral loads                                       b) longitudinal loads and vertical loads

    c) lateral, longitudinal and vertical loads         d) lateral and longitudinal loads

(32) Minimum spacing of vertical stiffeners is limited to (where d is the distance between flange angles)

    a) d/4                                               b) d/3

    c) d/2                                               d) 2d/3

(33) Bearing stiffeners are provided at; i) the supports, ii) the mid span, iii) the point of application of concentrated loads The correct answer is

    a) only (i)                                      b) both (i) and (ii)

    c) both (i) and (iii)                           d) (i), (ii) and (iii)

(34) The maximum spacing of vertical stiffeners is (where d is the distance between flange angles)

    a) 1.33 d                                      b) 1.25 d

    c) 1.5 d                                       d) 1.75 d

(35) The maximum permissible span of asbestos cement sheets is

    a) 650 mm                                  b) 810 mm

    c) 1250 mm                               d) 1680 mm

(36) To minimize the total cost of a roof truss, the ratio of the cost of truss to the cost of purlins shall be

    a) 1                                             b) 2

    c) 3                                             d) 4

(37) Generally the purlins are placed at the panel points so as to avoid

    a) axial force in rafter                         b) shear force in rafter

    c) deflection of rafter                       d) bending moment in rafter

(38) As per IS : 875, for the purposes of specifying basic wind velocity, the country has been divided into

    a) 4 zones                                  b) 5 zones

    c) 6 zones                                  d) 7 zones

(39) Minimum pitch provided in riveted steel tanks is (where d is diameter of rivets)

    a) 1.5 d                                      b) 2.0 d

    c) 2.5 d                                      d) 3.0 d

(40) Steel tanks are mainly designed for

    a) weight of tank                             b) wind pressure

    c) water pressure                           d) earthquake forces

(41) The minimum thickness of plates in a steel stack should be

    a) 4 mm                                      b) 5 mm

    c) 6 mm                                       d) 8 mm

(42) Hudson's formula gives the dead weight of a truss bridge as a function of

    a) bottom chord area                       b) top chord area

    c) effective span of bridge                 d) heaviest axle load of engine

(43) If the floor is supported at or near the bottom but top chords of a bridge are not braced, then the bridge is called

a) deck type                                  b) through type

c) half through type                          d) double deck type

(44) The effect of racking forces is considered in the design of, i) lateral braces, ii) chord
members; The correct answer is

a) only (i)                                   b) only (ii)

c) both (i) and (ii)                          d) none of the above

(45) The sway bracing is designed to transfer

a) 2Vi % of the top panel wind load to bottom    b) 10% of the top panel wind load to bottom
bracing                                           bracing

c) 25% of the top panel wind load to bottom      d) 50% of the top panel wind load to bottom
bracing                                           bracing

(46) compression force in two end posts The pin of a rocker bearing in a bridge isdesigned for

a) bearing and shear                          b) bending and shear

c) bearing and bending                        d) bearing, shear and bending

(47) The mechanism method and the statical method give

a) lower and upper bounds respectively on the    b) upper and lower bounds respectively on the
strength of structure                             strength of structure

c) lower bound on the strength of structure      d) upper bound on the strength of structure

(48) Shape factor is a property which depends

a) only on the ultimate stress of the material   b) only on the yield stress of the material

c)                                               d) both on the yield stress and ultimate stress of
only on the geometry of the section               material

(49) The mechanism method of plastic analysis satisfies

a) equilibrium and mechanism conditions          b) equilibrium and plastic moment conditions

c) mechanism and plastic moment conditions       d) equilibrium condition only

(50) Load factor is

a) always equal to factor of safety              b) always less than factor of safety

c) always greater than factor of safety          d) sometimes greater than factor of safety

(51) The ratio of plastic section modulus to elastic section modulus

a) is equal to 1                              b) is always less than 1

c) is always greater than 1                   d) can be less than 1

(52) Which of the following conditions is to be satisfied both in elastic and plasticanalysis ?

a) equilibrium condition                      b) yield condition

c) plastic moment condition                   d) mechanism condition

(53) In the virtual work method, the virtual quantity is

a) displacement                               b) load

c) slope                                      d) moment

(54) In case of plastic design, the calculated maximum shear capacity of a beam as perIS:800
shall be, (where, Aw = effective cross-sectional area resisting shear fy = yield stress of the
steel)

a) 0.55 Awfy                                  b) 0.65 Awfy

c) 0.75 Awfy                                  d) 0.85 Awfy

(55) The minimum thickness of a steel plate, which is directly exposed to weather andis not
accessible for cleaning and repainting, should be:

a) 4.5 mm
b) 6 mm
c) 8 mm
d) 10 mm

(56) The connection of intermediate vertical stiffeners to the web, not subjected to external loads, shall be designed for a minimum shear force (kN/m) of, (where, t = the web thickness in mm, h = the outstand of stiffener in mm)

a) 75 t2/h
b) 125 t3/h2
c) 125 t2/h
d) 175 t2/h

(57) For a compression member with double angle section, which of the following section will give larger value of minimum radius of gyration?

a) equal angles back to back
b) unqual legged angles with long legs back to back
c) unequal legged angles with short legs back to back
d) both (b) or (c)

(58) Lug angles

a) are used to reduce the length of connection.
b) are unequal angles.
c) increases shear lag.
d) all the above

(59) A steel beam supporting loads from the floor slab as well as from wall is termed as

a) stringer beam
b) lintel beam
c) spandrel beam
d) header beam

(60) Pitch of tacking rivets, when double angles connected back to back and acting as tension members should not be more than

a) 500 mm
b) 600 mm
c) 1000 mm
d) 300 mm