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Exam Paper Detailed Solution 2022

MPPSC-AE

Paper + Answer + Solution

Exam Date - 03 July, 2022

Civil Engineering

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51. The activity does not involve consumption of resources and does not need any time is called as-

(a) Negative activity (b) True activity

(c) Dummy activity (d) Positive activity

(c)

52. The difference between total float and free float is defined as-

(a) Independent float

(b) Interference float

(c) Dependent float

(d) Independent slack time

(c)

53. Which of the following contract is not measurement contract?

(a) Lump-sum contract

(b) Item rate contract

(c) Percentage rate contract

(d) None of the above

(c)

54. Worker's productivity is defined as-

(a) Total work done per week

(b) Quantity of work done per man hour

(c) Quantity of work done per month

(d) None of the above

(b)

55. The cost slope is given by-

(a) $\frac{\text{Normal cost-Crash cost}}{\text{Normal time-Crash time}}$

(b) $\frac{\text{Crash cost - Normal cost}}{\text{Crash duration - Normal time}}$

(c) $\frac{\text{Crash cost - Normal cost}}{\text{Normal duration - Crash duration}}$

(d) None of the above

(c)

56. Which is not the hydro power scheme/ plant?

(a) Run-off river Scheme

(b) Storage Scheme

(c) Pumped Storage Scheme

(d) Canal Scheme

(d)

57. Measurements of duty should not be taken-

(a) At the head of the main canal

(b) At the head of the branch canal

(c) At the middle of the canal

(d) At the outlet of the canal

(c)

58. A unit hydrograph consists of a hydrograph of direct runoff resulting from the following mentioned below which takes place uniformly over the basin at a uniform rate during a specified period of time-

(a) One cm of rainfall

(b) Ten cm of rainfall

(c) One cm of effective rainfall

(d) Ten cm of effective rainfall

(c)

59. Ground water is widely distributed under The ground and the geologic formation which can absorb water but cannot transmit significant amount of water known as with example-

(a) Aquiclude such as shale

(b) Aquiclude such as basalt

(c) Aquifuge such as clay

(d) Aquifuge such as granite

(a)

60. Stilling basin is used for-

(a) Drip irrigation

(b) Sprinkler irrigation

(c) Dissipation of energy

(d) Cross drainage work

(c)

61. A steel rod of 2.5 m in height and area of 125 mm^2 is subjected to a pull of 30kN. If Young's modulus is 200 GPa, the elongation of the rod will be-

(a) 3 mm (b) 30 mm

(c) 300 mm (d) 0.3 mm

(a)

62. For a given material, if E, G, and v are are Young's modulus, modulus of rigidity and Poisson's ratio respectively, then the relation E=

(a) 2G (1 + v) (b) 2G (1 - v)

(c) 2G/(1 + v) (d) 2G/(1 - v)

(a)

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63. Every material obeys the Hook's law within its-
(a) Elastic limit
(b) Limit of proportionality
(c) Plastic limit
(d) Modulus of elasticity

(b)

64. A framed structure is perfect, if the number of members are _____ (2J – 3), where J is joint.
(a) Equal to (b) Less than
(c) Greater than (d) None of the above

(a)

65. The strain energy per unit volume due to direct stress 'σ' and strain '$\in$ ' is equal to the-
(a) $2\sigma^2/E$ (b) $2\ E\in^2$
(c) $\frac{1}{2}E\in^2$ (d) None of the above

(c)

66. An activated sludge process operates at a flow rate of 540 m^3/d having Influent BOD_5 of 200 mg/L. Volume of aeration tank is 60 m^3 and biomass concentration in aeration tank is 3000 mg/L. The Food to Microorganism (F/M) ratio is-
(a) 0.4 (b) 0.6
(c) 0.8 (d) 0.2

(b)

67. An egg shaped section of sewer -
(a) Is economical than circular section
(b) Provides self-cleansing velocity
(c) Is more stable than circular
(d) is easy to construct

(b)

68. Suitable layout of distribution system for a city with road of rectangular pattern-
(a) Grid iron system
(b) Ring system
(c) Radial system
(d) Dead end system

(a)

69. Dissolved oxygen in stream is-
(a) Minimum at noon
(b) Maximum at mid night
(c) Same throughout the day
(d) Maximum at noon

(d)

70. In children "Methaemoglobinaemia" disease is caused by-
(a) Conversion of nitrites to nitrates
(b) Due to total nitrogen
(c) Conversion of nitrates to nitrites
(d) Reaction between haemoglobin and CO_2

(a)

71. An object placed in a fluid stream may experience drag and lift forces. These forces are due to-
(a) Viscosity and turbulence
(b) Pressure and gravity
(c) Pressure and turbulence
(d) Pressure and viscosity

(d)

72. In 1 in 40 model of a spillway, the velocity and discharge are 2m/s and 2.5 m^3/s, respectively. Find the velocity in the prototype.
(a) 126.5 m/s (8) 12.65 mm/s
(c) 12.65 m/s (d) 0.126 m/s

(c)

73. The flownet is a graphical representation irrotational flow.
(a) One dimensional
(b) Two dimensional
(c) Three dimensional
(d) None of the above

(b)

74. The energy loss in pipe is due to-
(a) Surface roughness only
(b) Turbulent shear stress
(c) Friction offered by pipe wall and viscous action
(d) Viscous action only

(c)

75. A wide unlined channel carrying silt free water has a depth of 2 m. The maximum tractive stress permissibles on the bed to prevent scour is 1.96 N/m^2. What is maximum slope that can be given to the channel?
(a) 3 in 10^4 (b) 2 in 10^4
(c) 1 in 10^3 (d) 1 in 10^4

(d)

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76. Find the specitic energy of flowing water through a rectangular channel of width 5m, when the dopth of water is 3m and discharge is 10m/s.

(a) 30.2m (b) 3.0226m
(c) 3022.4cm (d) 3.0224cm

(b)

77. Find the rate of flow of water through a rectangular channel of 6m wide and 3m deep, when it is running full. The bed slope of channel is 1 in 2000. Take Chezy's constant C = 55.

(a) 27.108 m^3/s (b) 2.7108 m^3/s
(c) 1.506 m^3/s (d) 0.2710 m^3/s

(a)

78. Which of the following devices are usually used in measuring pipe flow?

(a) Mouthpiece (b) Cipolletti weir
(c) Pitot tube (d) Venturimeter

(d)

79. The most desirable location for the surge tank is-

(a) Immediately upstream of the turbine
(b) Immediately upstream of the tail water
(c) Immediately downstream of the reservoir
(d) Immediately upstream of the reservoir

(c)

80. For the laminar boundary layer, its thickness is expressed by the relationship (Where R_x is the local Reynolds number based on distance x from the leading edge)

(a) $\delta = 0.664 \times R_x^{0.20}$

(b) $\delta = 0.664 \times / \sqrt{R_x}$

(c) $\delta = 5x / \sqrt{R_x}$

(d) $\delta = 1.75 \times \sqrt{R_x}$

(c)

81. Classification of road in India was done by-

(a) Central Government
(b) Indian Road Congress
(c) Ministry of Surface Transport
(d) Nagpur Road Plan

(d)

82. The drainage layer in the highway pavement is known as-

(a) Base course (b) Sub-base course
(c) Surface course (d) Subgrade

(b)

83. If R is the radius of a main curve and L is the length of the transition curve, the shift of the curve is-

(a) $L^2/24\ R$ (b) $L/24\ R$
(c) $L^4/24\ R$ (d) $L^3/24\ R$

(a)

84. In California Bearing Ratio test, the value of CBR is calculated at-

(a) 2.5 mm penetration only
(b) 5.0 mm penetration only
(c) Both 25 mm and 50mm penetrations
(d) 7.5 mm penetration only

(c)

85. For the construction of cement concrete pavement slabs, the desirable limit of maximum aggregate crushing value is-

(a) 35% (b) 30%
(c) 27% (d) 24%

(b)

86. If drainage is permitted throughout the test, during the application of both normal and shear stresses, so that full consolidation occurs and no excess pore pressure is set-up at any stage of the lest, is known as-

(a) Drained test (b) Quick test
(c) C-U tesi (d) Compression test

(a)

87. In site exploration, depth upto which the increase in pressure is likely to cause shear failure is known as-

(a) Significant depth (b) Failure depth
(c) Pressure depth (d) Exploration depth

(a)

88. The minimum net pressure intensity causing shear failure of soil, is known as-

(a) Sale bearing capacity
(b) Net safe bearing capacity
(c) Ultimate bearing capacity
(d) Net ultimate bearing capacity

(d)

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89. Which of the following is a characteristic of general shear failure ?

(a) Failure is accompanied by compressibility of soil

(b) Failure is sudden

(c) Bulging of shearing mass of soil

(d) Depression of soil

(c)

90. The piles that are used for protecting structures from ships and floating objects are-

(a) Anchor piles (b) Compaction piles

(c) Batter piles (d) Fender piles

(d)

91. Width of Ballast section at bottom of track for B.G. is-

(a) 4200 mm (b) 4600 mm

(c) 4800 mm (d) 5000 mm

(c)

92. Which type of transition curve is mostly used by Indian Railways ?

(a) Cubic parabola curve

(b) Spiral curve

(c) Sine curve

(d) Lemniscate of Bernoulli's curve

(a)

93. The displacement of the track from its original position due to insufficient expansion gap in the track is known as-

(a) Distorting (b) Hogging

(c) Creeping (d) Buckling

(d)

94. Heel Divergence is defined as-

(a) Ratio of length of tongue rail to switch angle

(b) Ratio of switch angle to length of tongue rail

(c) Multiplication of length of tongue rail and switch angle

(d) Multiplication of wing rail and switch angle

(*) No option is correct

95. The outer rim of the railway wheels are coned to prevent the rubbing of the wheel flanges with sides of the top flanges of the rail at a slope of-

(a) 1 in 20 (b) 1 in 24

(c) 1 in 26 (d) 1 in 30

(a)

96. The deflection of beam with straight tendon's having uniform eccentrictity below the centroid axis is given by (where P = effective prestressing force, e = eccentricity, L = length of beam, a = deflection)-

(a) $a=-\frac{PeL^2}{12EI}$ (b) $a=-\frac{PeL^3}{12EI}$

(c) $a=-\frac{PeL^2}{8EI}$ (d) $a=-\frac{PeL^3}{8EI}$

(c)

97. The foundation that is used when bearing power of soil is so low that independent column footings are impracticable and pile foundation **cannot** be used advantageously is-

(a) Strap foundation

(b) Compined foundation

(c) Raft or Mat foundation

(d) Rectangular combined foundation

(c)

98. As per IS: 1343 : 1980, in prestressed concrete minimum grade of concrete for pre-tensioned system will be-

(a) M 40 (b) M 55

(c) M 30 (d) M 20

(a)

99. As per IS: 456: 2000. In case of flat slab the minimum thickness of slab shall be-

(a) 100 mm (b) 115 mm

(c) 125 mm (d) 150 mm

(c)

100. As per IS: 1893:2002, the critical damping ratio in case of steel structures, concrete structures and earthen structures are respectively-

(a) 5%, 2% and 20% (b) 2%, 20% and 5%

(c) 20%, 5% and 2% (d) 2%, 5% and 20%

(d)

101. In a bracket with riveted connections the no. of rivets (n) essential for resisting the external moment M is equal to ---------- Where, R-rivet value, m - no. of rivet lines and p - pitch of rivets-

(a) $n=\sqrt{\frac{6Rm}{Mp}}$ (b) $n=\sqrt{\frac{6M}{mpR}}$

(c) $n=\sqrt{\frac{6M}{mR}}$ (d) $n=\sqrt{\frac{6Mm}{pR}}$

(b)

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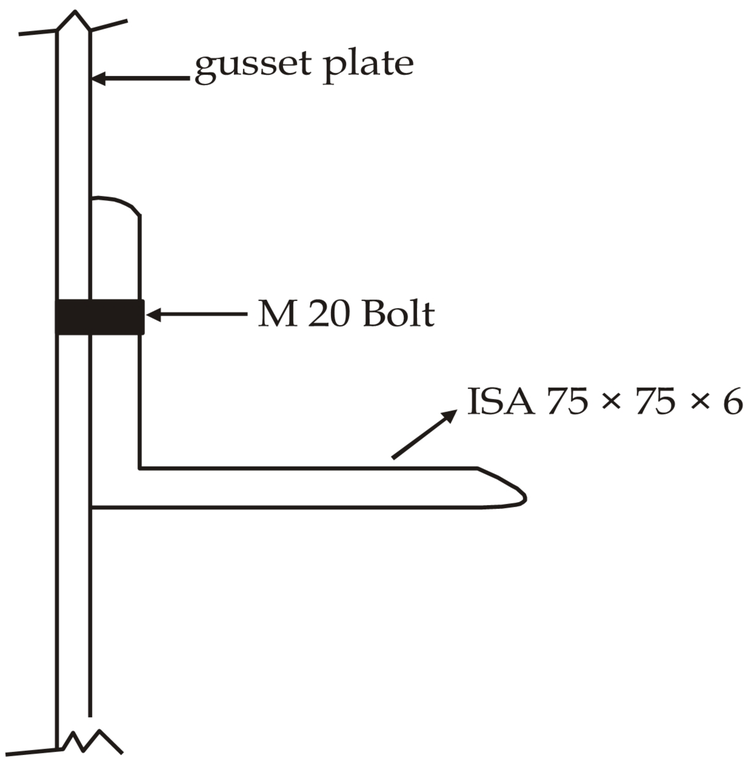
102. If the fillet welds are subjected to a combination of normal stress (f_a) and shear stress (q), the equivalent stress (f_e) is-

(a) $\sqrt{f_a^2 + q^2}$ (b) $\sqrt{3f_a^2 + 3q^2}$

(c) $\sqrt{f_a^2 + 3q^2}$ (d) $\sqrt{3f_a^2 + q^2}$

(c)

103. An angle is ISA 75 × 75 × 6 is connected to a gusset plate through single leg as shown in figure. Bolt used are M 20 arade 4.6. What is net area of angle?



(a) 732 mm² (b) 862 mm²

(c) 600 mm² (d) 432 mm²

(a)

104. A steel structure subjected to a combination of Dead Load (DL) and Earthquake Load (EL), the partial safety factors for limit state of strength are ..... and respectively.

(a) 1.2; 1.2 (b) 1.5; 1.0

(c) 1.5; 1.5 (d) 1.0; 1.2

(c)

105. If the intermediate transverse stiffners to web are not subjected to external loading, then it shall be designed to withstand a minimum shear force (in kN/mm) of-
(Where, L= Web thickness in mm,
b_s = Outstand width of the stiffner in mm.)

(a) $\frac{t_w^3}{5b_s}$ (b) $\frac{t_w^2}{5b_s}$

(c) $\frac{5t_w^2}{b_s}$ (d) $\frac{t_w}{5b_s^2}$

(a)

106. The water required for firefighting (known as fire-demand) may be compuled using National Board of Fire underwrites formula given as-

$Q = 4637\sqrt{P}\,(1\text{-}0.01\sqrt{P})$ where

(a) Q = quantity of water in m/s and P is more than 2,00,000

(b) Q = quantity of water in L/min and P is more than 2,00,000

(c) Q = quantity of water in m^3/s and P is less than or equal to 2,00,000

(d) Q = quantity of water in L/min and P is less than or equal to 2,00,000

(d)

107. Modern turbidimeters working on the principles of scattering of light, are known as-

(a) Jackson turbidimeter

(b) Modern ion chromatography

(c) Nephlo turbidimeter

(d) Atomic turbidimeter

(c)

108. In a waste water treatment plant, grit chamber are designed to remove particles by using the principles of-

(a) Type - I settling (b) Type - II settling

(c) Type - III settling (d) Type - IV settling

(a)

109. London Smog was primarily caused by-

(a) Burning of oil

(b) Burning of coal

(c) Eruption of volcano

(d) None of the above

(b)

110. Which one of the following method is generally not adopted for safe disposal of biomedical wastes?

(a) Shredding after disinfection

(b) Incineration

(c) Sanitary landfill

(d) None of the above

(c)

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111. The size of the wooden sleeper used on broad gauge is-
(a) 275 cm × 32 cm × 13 cm
(b) 275 cm × 25 cm × 18 cm
(c) 275 cm × 25 cm × 13 cm
(d) 275 cm × 25 cm × 32 cm

(c)

112. Fish plates used in Indian Railway should have the carbon contents oqual to-
(a) 0.38% to 0.47% (b) 0.30% to 0.42%
(c) 0.25% to 0.42% (d) 0.15% to 0.47%

(b)

113. Morgan keys are suitable for CI chairs, plate sleepers and metal sleepers. There specifications are-
(a) 12 cm long with a taper of 1 in 48
(b) 12 cm long with a taper of 1 in 30
(c) 18 cm long with a taper of 1 in 48
(d) 18 cm long with a taper of 1 in 32

(d)

114. Train resistance due to gradient is given as
(a) Weight of train × rate of grade
(b) Weight of train × $\frac{1}{\text{rate of grade}}$
(c) Weight of train × $\frac{2}{\text{rate of grade}}$
(d) Twice the weight of train × rate of grade

(a)

115. Worn up rail should not be used if the wear exceeds the limit between-
(a) 7% to 10% (b) 3% to 4.5%
(c) 10% to 12.5% (d) 5% to 8.0%

(b)

116. V_v / V_s =
(a) Porosity (b) Water content
(c) Void ratio (d) Degree of saturation

(c)

117. At shrinkage limit, the soil is-
(a) Dry
(b) Fully Saturated
(c) Partially Saturated
(d) None of the above

(b)

118. If the natural water content of the soil mass lies between its liquid limit and plastic limit, the soil mass is said to be in-
(a) Liquid state (b) Semi-solid state
(c) Solid state (d) Plastic state

(d)

119. The co-efficient of compressibility of soil is the ratio of-
(a) Stress to strain
(b) Strain to stress
(c) Stress to settlement
(d) Rate of loading to settlement

(b)

120. Under-reamed piles are generally-
(a) Driven piles (b) Pre-cast piles
(c) Bored piles (d) None of the above

(c)

121. If N = No. of years prescribed for completion of project
A = Maximum value of works completed during last 5 years
B = Value of on going work in the next N years
then Bid capacity is calculated as-
(a) 2AB-N (b) 2BN-A
(c) 2AN - B (d) None of the above

(c)

122. Building and other construction workers Central Rules, 1998 is not related-
(a) To ensure all mechanical equipments are provided with safety features
(b) To ensure minimum salary to be provided to all labours
(c) To ensure workers do not lift weight beyond prescribed limit
(d) To maintain clean and hygienic conditions on site

(b)

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123. A concrete mixer having a Initial cost of Rs. 2 lakh and a salvage value of Rs. 50,000 at the end economic life of 5 years. What will be annual depreciation each year using straight line method?

(a) Rs. 30,000 (b) Rs. 40,000
(c) Rs.50,000 (d) Rs. 33,333

(a)

124. Performance security is refunded to the contractor-

(a) After issue of defect liability certificate
(b) After issue of completion certificate
(c) As per contractor demand after completion of work
(d) None of the above

(a)

125. The estimate prepared for approval to include additional item of work during execution which was not foresoen in Initial stage is called as-

(a) Rough order of magnitude estimate
(b) Cube rate estimate
(c) Indicative cost estimate
(d) Supplementary estimate

(d)

126. A simply supported beam of span 'l' carries a concentrated load 'W' at the centre. The bending moment at mid-point will be-

(a) $\frac{1}{8}Wl$ (b) $\frac{1}{2}Wl$
(c) $\frac{1}{4}Wl$ (d) $\frac{1}{8}Wl^2$

(c)

127. The two hinged arch is an example of-

(a) Statically indeterminate structure
(b) Statically determinate structure
(c) Both (a) and (b)
(d) None of the above

(a)

128. The bending equation is written as-

(a) $\frac{I}{M}=\frac{\sigma}{y}=\frac{E}{R}$ (b) $\frac{M}{I}=\frac{\sigma^2}{y}=\frac{E^2}{R^2}$
(c) $\frac{M}{I}=\frac{\sigma}{y}=\frac{E}{R}$ (d) $\frac{M^2}{I}=\frac{\sigma^2}{y}=\frac{E^2}{R}$

(c)

129. For ductile materials, the most appropriate failure theory is-

(a) Maximum principal stress theory
(b) Maximum shear stress theory
(c) Maximum principal strain theory
(d) Shear-strain energy theory

(b)

130. the maximum principal stress theory was postulated by-

(a) Rankine (b) St. Venant
(c) Mohr (d) Tresca

(a)

131. The limitation of Bligh's theory observed as-

(a) Made no distinction between horizontal and vertical creep
(b) Made no explanation of exit gradient
(c) Made no distinction between outer and inner faces of sheet piles
(d) All the above

(d)

132. A device where silt is excluded from water entering the canal is known as the following and placed at-

(a) Silt ejector placed infront of head regulator
(b) Silt ejector placed behind the head regulator
(c) Silt excluder placed infront of head regulator
(d) Silt excluder placed behind the head regulator

(d)

133. Which statement is not true for canal lining?

(a) Minimize the seepage losses
(b) Reduce maintenance of canal
(c) Prevent erosion
(d) Decrease discharge

(d)

134. A larger length of groyne pointing upstream used for river training works is known as-

(a) Attracting Groyne
(b) Repelling Groyne
(c) Deflecting Groyne
(d) Sedimentary Groyne

(b)

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135. In cross drainage works, if natural drainage is carried over the canal where F.S.L. of the canal is lower than the underside of the trough carrying drainage water, then it can be said as-

(a) Aqueduct (b) Syphon aqueduct
(c) Canal syphon (d) Super passage

(d)

136. A singly reinforced beam 200 mm wide is 400 mm deep to the center of the tensile reinforcement. Determine the limiting moment of resistance of the beam section. Use M 20 Concrete and Fe 250 Steel-

(a) 9.536 kN.m (b) 95.36 kN.m
(c) 953.60 KN.m (d) 80.00 KN.m

(b)

137. For bond stress of deformed bars conforming to IS 1786, design bond stress of plain bars in tension in limit state method shall be increased by-

(a) 25% (b) 40%
(c) 60% (d) 75%

(c)

138. The Hoop tension per meter height for circular tank with a flexible joint between the walls and base is given by (where W = specific wt of water. D = Internal diameter of tank, h=depth and T=hoop tension)

(a) $D = wh \times \frac{T}{2}$ (b) $T = wh \times \frac{D}{4}$

(c) $T = wh \times \frac{D}{6}$ (d) $T = wh \times \frac{D}{2}$

(d)

139. What is the recommended value of effective length, if the column is effectively held in position and fixed against rotation in both ends? (l= Unsupported longth of column)

(a) 0.65 l (b) 0.80 l
(c) 1.00 l (d) 1.20 l

(a)

140. The development length (L_d) of a deformed bar (ϕ = nominal diameter) as per IS: 456 : 2000 in limit state design is given by (where σ_s = stress in a bar at the section considered at design load, τ_{bd} = design bond stress)

(a) $L_d = \frac{\sigma_s \phi}{4.5\tau_{bd}}$ (b) $L_d = \frac{\sigma_s \phi}{5.0\tau_{bd}}$

(c) $L_d = \frac{\tau_{bd} \phi}{5.0\sigma_s}$ (d) $L_d = \frac{\sigma_s \phi}{4\tau_{bd}}$

(*) No option is correct

141. The stress in cement concrete pavement changes-

(a) Seasonally (b) Annually
(c) Daily (d) None of the above

(c)

142. The rise of water level near bridge due to obstruction caused by the construction of bridge is called as-

(a) Superlex (b) Afflux
(c) Dulex (d) Scouring

(b)

143. According to ICAO, all markings on the runways are-

(a) Yellow (b) White
(c) Black (d) Red

(b)

144. The maximum transverse grade as per ICAO of 'D' type airport is-

(a) 1.5% (b) 2.0%
(c) 2.5% (d) 3.0%

(b)

145. Airport elevation is the reduced level above mean sea level of-

(a) Control tower
(b) Hanger
(c) Highest point of the landing area
(d) Lowest point of the landing area

(c)

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146. A riveted connection with 18 mm diameter rivets in double shear are used to connect 10 mm thick plates. If permissible stresses for rivets in shear and bearing are 80 MPa and 250 MPa respectively as well as for the plate in bearing is 250 MPa, then the strength of rivet is

(Values are rounded off to nearest Integer value)

(a) 48750 N (b) 23892 N

(c) 97500 N (d) 47784 N

(d)

147. An ISLB 300 section is used as a simply supported beam having span of 5 m. If the sectional modulus is 4.889×10^5 mm^3 and plastic modulus is 5.4206×10^5 mm^3 then the shape factor of the beam is-

(a) 1.10 (b) 0.90

(c) 0.80 (d) 0.72

(a)

148. A steel section is being used as tension member. The cross section area is 1100 mm^2 and yield strength of steel section is 250 MPa. If the design is governed by yielding of the cross section under axial tension, then the design strength (T_{ds}) of the member is-

(a) 150 KN (b) 250 KN

(c) 100 KN (d) None of the above

(b)

149. A column base is subjected to combined action of axial load and moment. If the Intensity of bearing pressure due to axial load is equal to maximum pressure generated due to moment, then the total bearing pressure between the column base and concrete is-

(a) Uniform compression throughout

(b) Zero at one end and compression at other ond

(c) Tension at one end and compression at other end

(d) Uniform tonsion throughout

(b)

150. Butt weld used in a welded connection is subjected to combined action of bearing, bending and shear. If bearing stress f_{br} = 200 MPa, bending stress f_b =120 MPa and shear stress q =90 MPa, then the equivalent stress f_e the butt weld subjected is equal to

(Values rounded off to integer)

(a) 420 MPa (b) 200 MPa

(c) 270 MPa (d) 320 MPa

(d)

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