

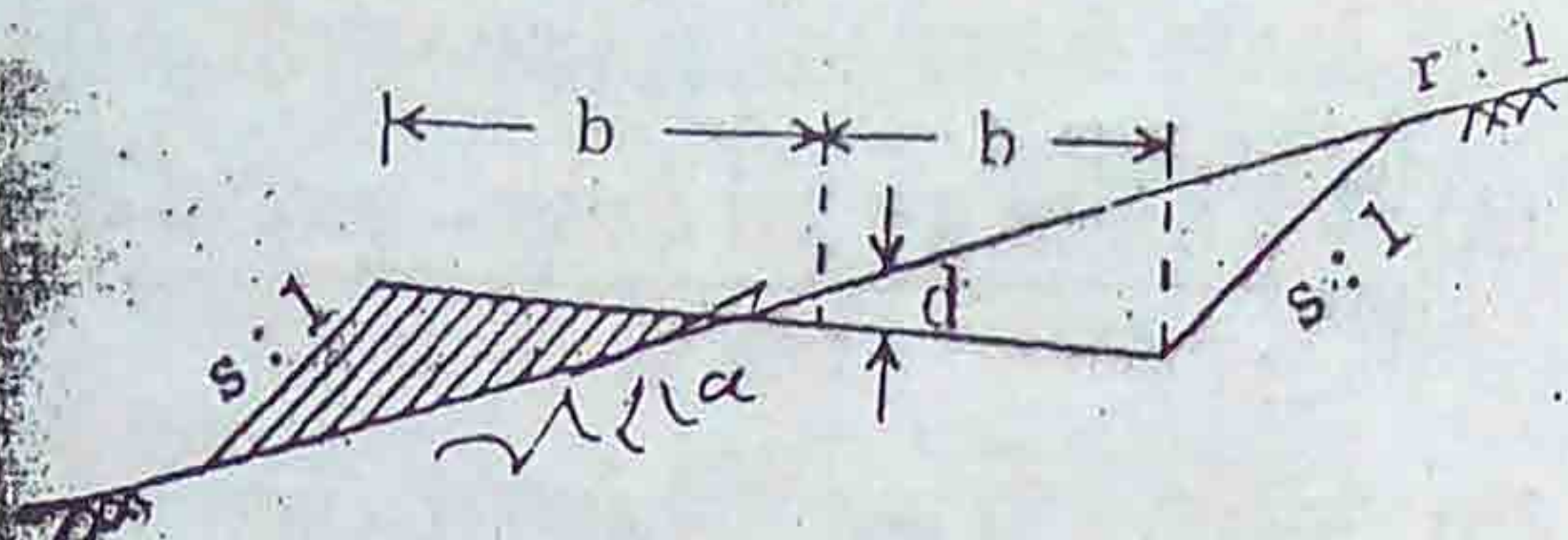
TEST - (iii)
PART (A) GENERAL ENGINEERING
(Civil and Structural)

Civil

101. The volatile diluent added to a paint is known as
(A) drier (B) pigment
(C) thinner (D) distemper
102. Hardness of rock can be tested in situ using
(A) Smith's test
(B) Schmidt Hammer test
(C) Acid test
(D) Crystallization test
103. Unit weight of brick work is about
(A) 17 - 18 kN/m³ (B) 18 - 19 kN/m³
(C) 19 - 20 kN/m³ (D) 20 - 21 kN/m³
104. Which one of the following is the purest form of iron?
(A) Cast iron (B) Wrought iron
(C) Mild steel (D) High carbon steel
105. For R.C.C. construction, the maximum size of coarse aggregate is limited to
(A) 10 mm (B) 15 mm
(C) 20 mm (D) 25 mm
106. Presence of oils in water for concreting
(A) gives smooth surface
(B) gives more slump
(C) improves strength
(D) reduces strength
107. Floor Area Ratio (F.A.R.) means
(A) $\frac{\text{Total floor area of all floors} - \text{Area of ground floor}}{\text{Area of plot}}$
(B) $\frac{\text{Total floor area of all floors} - \text{Area of ground floor}}{\text{Area of plinth}}$
(C) $\frac{\text{Total floor area of all floors}}{\text{Area of plot}}$
(D) $\frac{\text{Total floor area of all floors}}{\text{Area of plinth}}$
108. The damp proof course is measured in
(A) length
(B) area
(C) volume
(D) weight
109. The most reliable estimate is
(A) Plinth area estimate
(B) Detailed estimate
(C) Preliminary estimate
(D) Cube rate estimate
110. The unit of measurement is per square meter for
(A) Collapsible gates with rails
(B) Rolling shutters
(C) Expanded metal wire
(D) Reinforcement of R.C.C.

SPACE FOR ROUGH WORK

111. The cross-section of a road partly in banking and partly in cutting is shown in the following figure. The area of the shaded portion is



- (A) $\frac{1}{2} \times \frac{(b - rd)^2}{r - s}$
- (B) $\frac{1}{3} \times \frac{(b - rd)^2}{r - s}$
- (C) $\frac{1}{2} \times \frac{(b + rd)^2}{r - s}$
- (D) $\frac{1}{3} \times \frac{(b + rd)^2}{r - s}$

113. A building is an obstacle to
- (A) both chaining and ranging
- (B) chaining but not ranging
- (C) ranging but not chaining
- (D) neither chaining nor ranging

114. The following bearings were observed while traversing with a compass. Which stations are affected by local attraction?

Line	F.B.	B.B.
AB	104° 30'	284° 30'
BG	48° 15'	226° 05'
CD	290° 30'	115° 15'
DA	180° 15'	357° 15'

- (A) A and D
- (B) C and D
- (C) B and C
- (D) A and B

115. If fore bearing of a line is N 30° E, the back bearing of the line is

- (A) N 30° W
- (B) N 30° E
- (C) S 30° W
- (D) S 30° E

116. An anallatic lens is provided in a

- (A) Theodolite
- (B) Tacheometer
- (C) Dumpy level
- (D) Prismatic compass

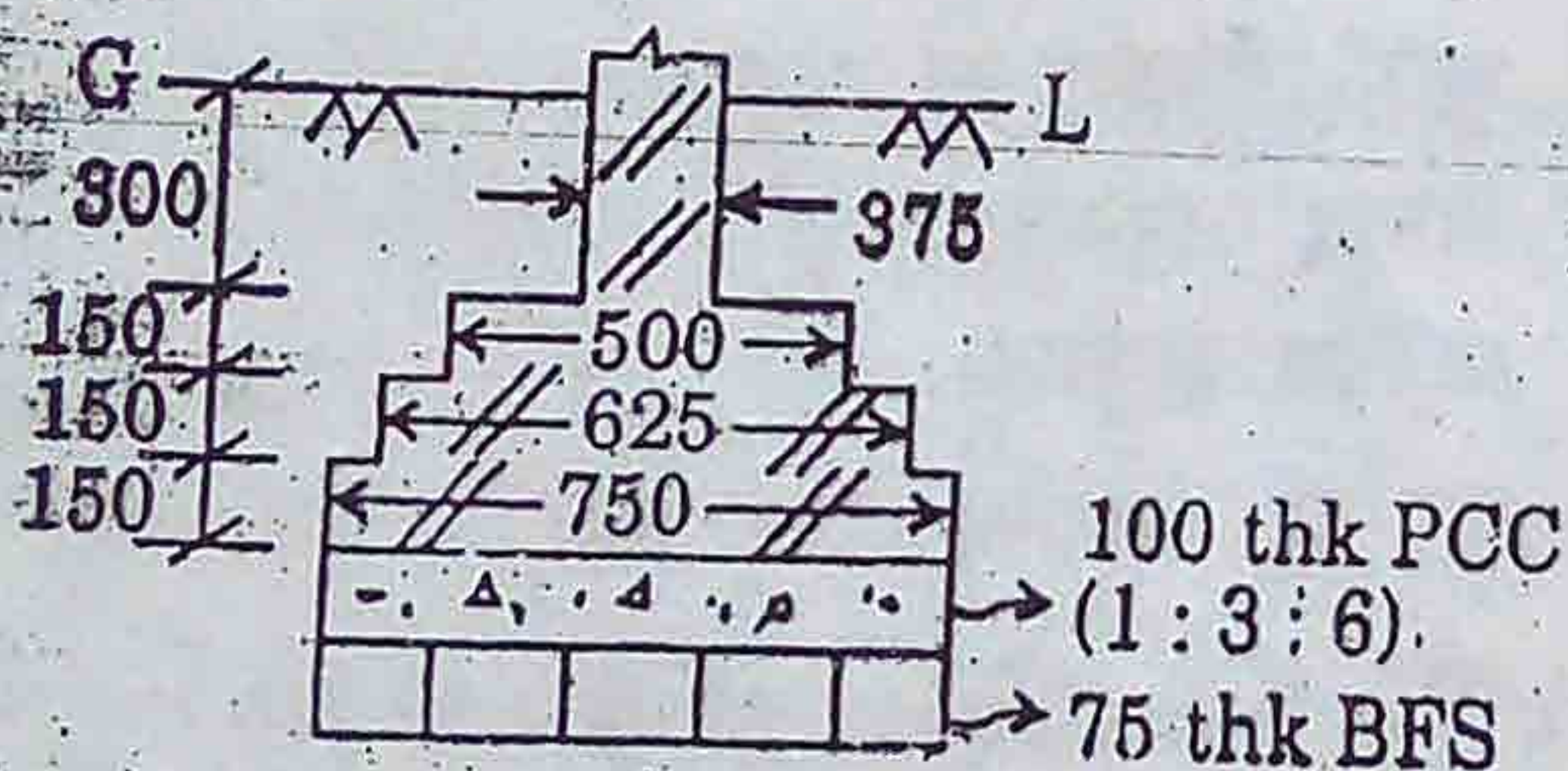
117. Which of the following methods of table surveying is used to locate the position of an inaccessible point?

- (A) Radiation
- (B) Intersection
- (C) Traversing
- (D) Resection

118. The multiplying constant of a tacheometer is

- (A) $f + d$
- (B) $f - d$
- (C) $f/i + d$
- (D) $f/i - d$

112. The cross-section of a strip footing is shown below.



All dimensions are in mm.

The quantity of BFS under the footing per metre length is

- (A) 0.750 cu.m
- (B) 0.750 sq.m
- (C) 0.056 cu.m
- (D) 0.056 sq.m

SPACE FOR ROUGH WORK

2/2/19

119. The unit weight of a completely saturated soil is given by

- ~~(A)~~ $\frac{(G+e)\gamma_w}{1+e}$ (B) $\frac{(1+e)\gamma_w}{G+e}$
- (C) $\frac{(G-1)\gamma_w}{1+e}$ (D) $\frac{(1-e)\gamma_w}{G+e}$

where, G = Specific gravity of solids

e = Void ratio

γ_w = Unit weight of water

120. Valid range for S , the degree of saturation of soil, in percentage, is

- (A) $S > 0$ (B) $S \leq 0$
- (C) $0 < S < 100$ ~~(D) $0 \leq S \leq 100$~~

121. A soil has a bulk density of 22 kN/m^3 and water content 10%. The dry density of soil in kN/m^3 is

- (A) 18.6 ~~(B) 20.0~~ $\frac{22}{1.1}$
- (C) 22.0 (D) 23.2

122. A pycnometer is used to determine

- (A) water content and void ratio
- (B) specific gravity and dry density
- ~~(C) water content and specific gravity~~
- (D) void ratio and dry density

123. Toughness index is defined as the ratio of

- (A) Plasticity index to Consistency index
- ~~(B) Plasticity index to Flow index~~
- (C) Liquidity index to Flow index
- (D) Consistency index to Liquidity index

124. The dimensions of surface tension are

- ~~(A) $M^1 L^0 T^{-2}$~~ (B) $M^1 L^{-1}$
- (C) $M^1 L^1 T^{-2}$ (D) $F^1 T^{-2}$

125. The height of hydraulic jump is equal to

- (A) sequent depth
- ~~(B) difference in conjugate depths~~
- (C) difference in alternate depths
- (D) initial depth

126. In a Newtonian fluid

- ~~(A) the shear stress is directly proportional to the rate of fluid deformation~~
- (B) dynamic viscosity is directly proportional to the rate of fluid deformation
- (C) kinematic viscosity is directly proportional to the rate of fluid deformation
- (D) dynamic viscosity is zero

127. A soil has an average particle size of 0.2 mm. It is predominantly

- (A) gravel (कंकड़) ~~(B) sand (बालु रेत)~~
- ~~(C) silt (सिंद)~~ (D) clay (मृत्तिका)

128. The expression for the discharge (Q) through a flow net for isotropic soils is given by

- (A) $Q = KH \times \frac{N_F}{N_D}$ ✓
- ~~(B) $Q = KH \sqrt{\frac{N_F}{N_D}}$~~
- (C) $Q = KH \left(\frac{N_F}{N_D}\right)^2$
- (D) $Q = KH \left(\frac{N_F}{N_D}\right)^3$

SPACE FOR ROUGH WORK

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129. For the irrigation of a crop, the base period B (in days), depth of water Δ (in metres) are related to the duty D (in ha/cumec) at the field as

(A) $D = \frac{0.864 B}{\Delta}$ (B) $D = \frac{0.864 \Delta}{B}$

(C) $D = \frac{8.64 B}{\Delta}$ (D) $D = \frac{1.98 B}{\Delta}$

130. In designing hydraulic structures in alluvial rivers, the equation that is used to calculate the normal depth of scour R for a discharge intensity of $q \text{ m}^3/\text{s}/\text{m}$ is

(A) $R = 1.35 (q/f)^{2/3}$

(B) $R = 1.2 (q^2/g)^{1/3}$

(C) $R = 1.35 (q^2/f)^{1/3}$

(D) $R = 4.75 (q)^{1/2}$

131. An earthen channel has been designed on Lacey formulae to carry a full supply discharge of $30 \text{ m}^3/\text{s}$. The median size of the soil is 0.3 mm . The mean velocity of flow at this discharge is

(A) 0.98 m/s (B) 0.76 m/s

(C) 2.2 m/s (D) 1.36 m/s

132. Which of the following spillways is least suitable for an earthen dam?

(A) Chute spillway

(B) Side channel spillway

(C) Shaft spillway

(D) Ogee spillway

133. A floating body will remain in stable equilibrium if the metacentre is

(A) above the centre of buoyancy

(B) above the centre of gravity

(C) below the centre of gravity

(D) below the centre of buoyancy

134. The pressure of a liquid measured with the help of a piezometer tube is

(A) atmospheric pressure

(B) gauge pressure

(C) absolute pressure

(D) vacuum pressure

135. A hydrometer is used to measure

(A) velocity of fluids

(B) velocity of gases

(C) flow of fluids

(D) specific gravity of liquids

136. Continuity equation is based on the principle of conservation of

(A) energy

(B) mass

(C) momentum

(D) both (A) and (B)

137. The discharge over a broad-crested weir is maximum when the depth of flow is

(A) $\frac{H}{3}$

(B) $\frac{2H}{3}$

(C) $\frac{H}{2}$

(D) $\frac{2H}{5}$

SPACE FOR ROUGH WORK

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$f = \frac{M y}{I}$
 $\frac{M}{I} = \frac{F}{y}$

TEST - (iii)
PART (A) GENERAL ENGINEERING
(Civil and Structural)
Structural

151. Identify the erroneous statement.

Mild steel

- (A) has two yield points.
 (B) is a ductile material.
 (C) has small percent elongation at failure.
 (D) shows strain hardening.

152. The maximum numerical value of Poisson's ratio is

- (A) 0.0 (B) 0.25
 (C) 0.50 (D) 1.00

153. If the column ends are effectively held in position and restrained against rotation at both ends, then the effective length is

- (A) 2L (B) L/2
 (C) 0.707L (D) L

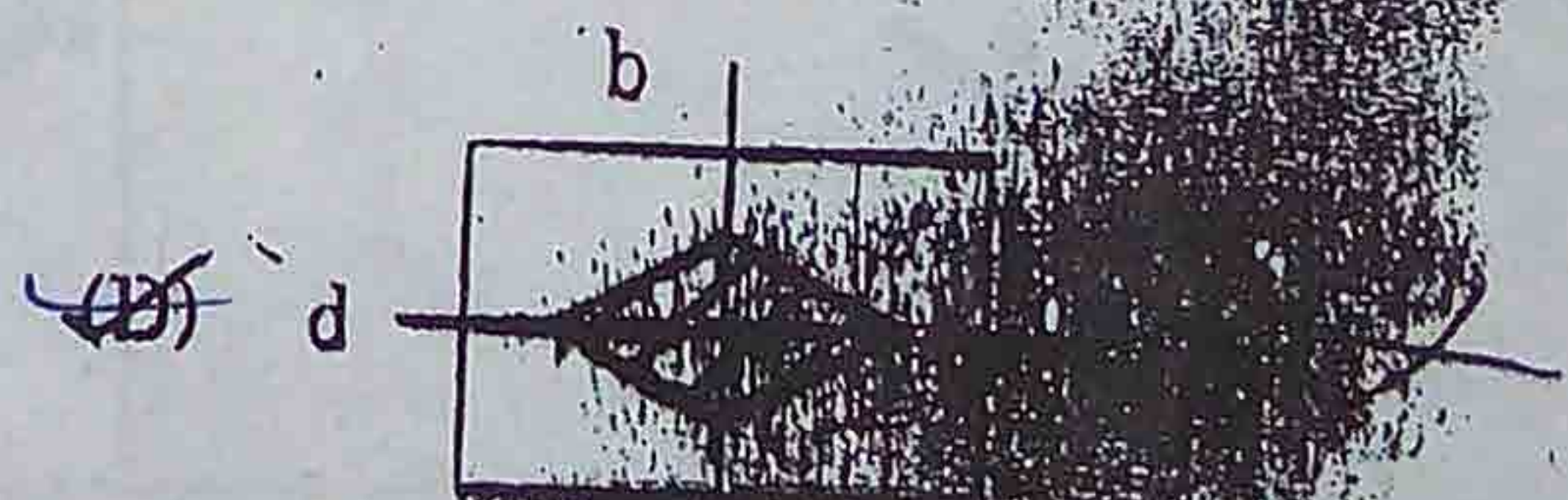
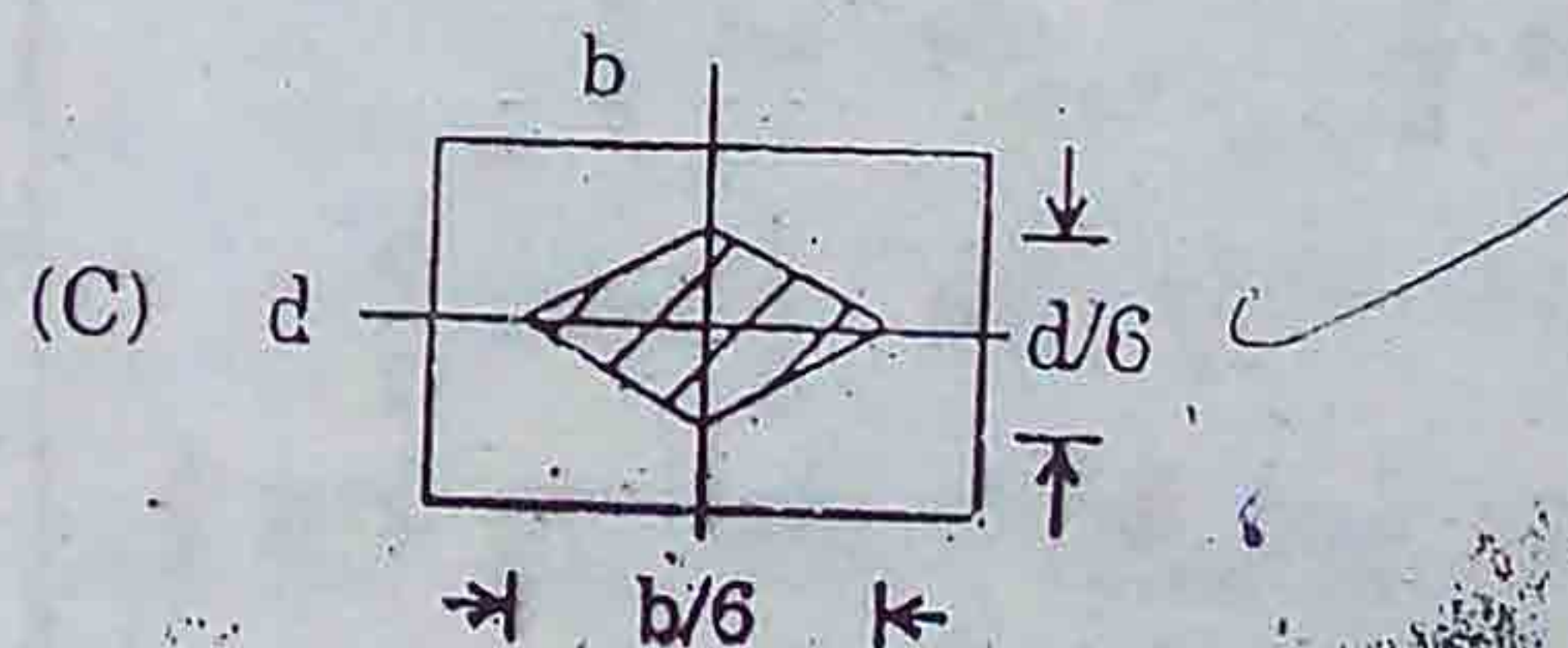
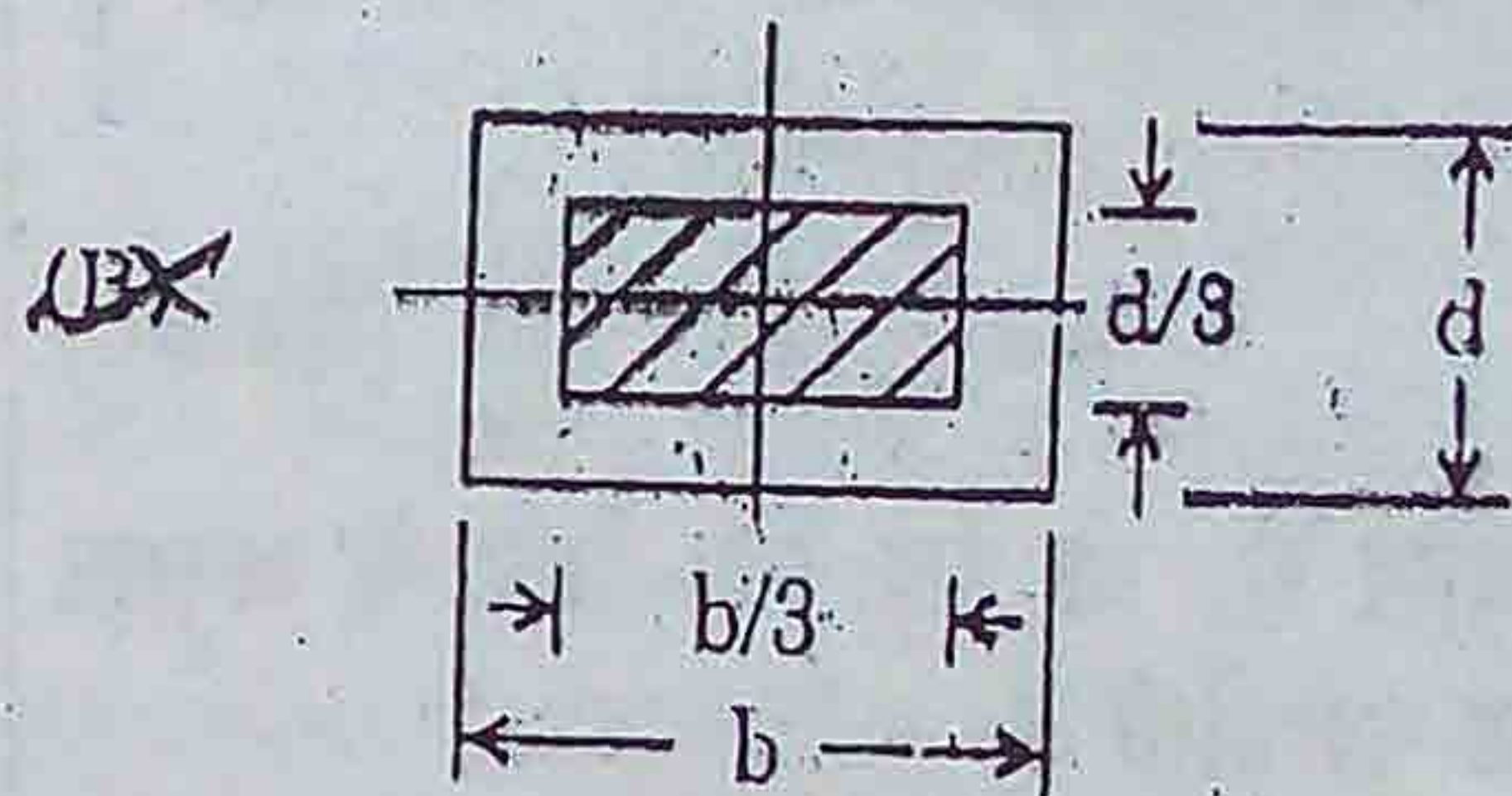
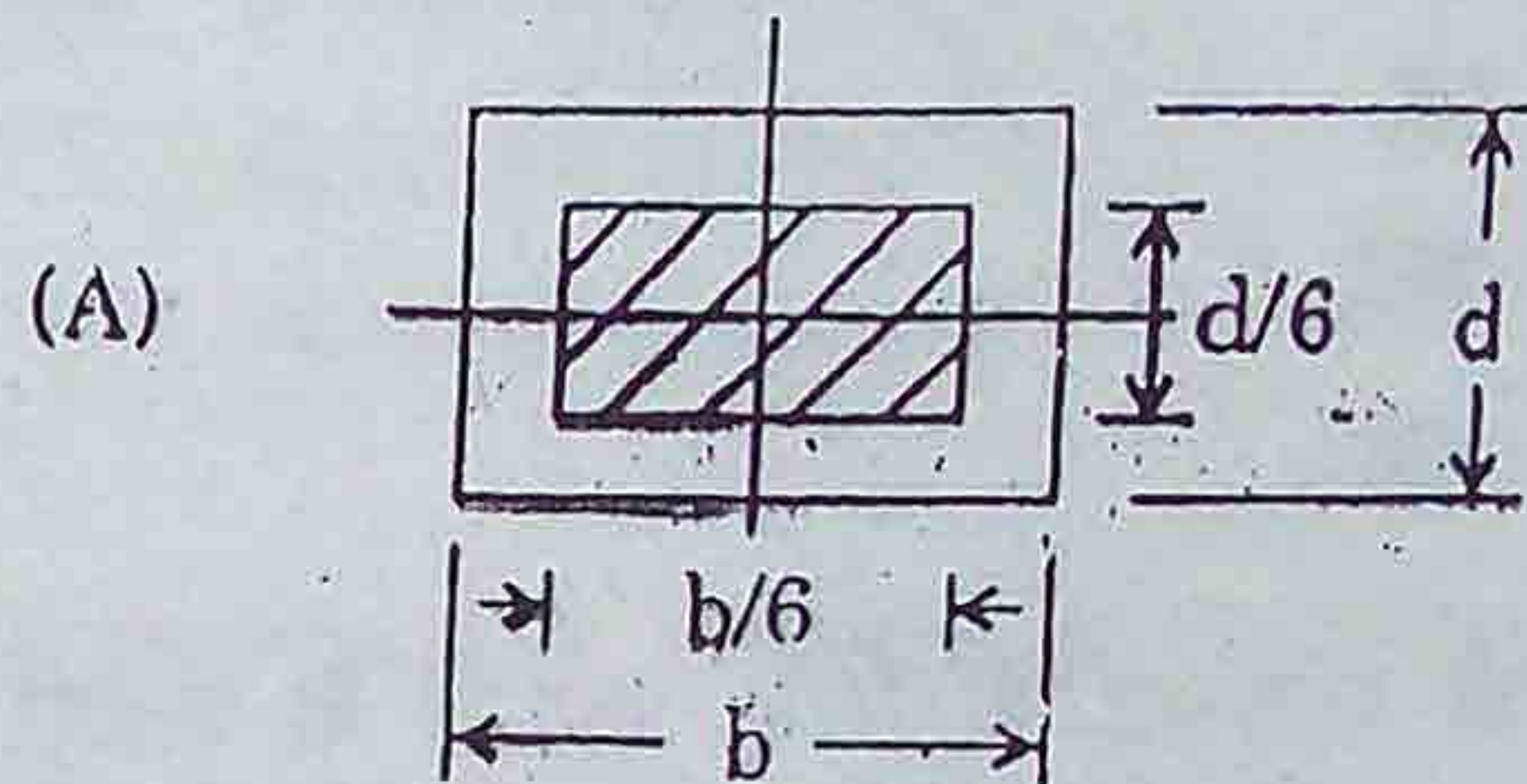
154. The modulus of elasticity of steel is

- (A) 2×10^4 MPa
 (B) 1.2×10^5 MPa
 (C) 2×10^5 MPa
 (D) 2×10^6 MPa

155. The bending stress on a prismatic beam is given by

- (A) My/Z (B) My/I
 (C) MZ/y (D) MI/y

156. Which eccentric load, if placed within the central core shown in figures below, does not produce tension in the column cross-section?



157. The working stress of a material is expected to be

- (A) equal to ultimate stress
 (B) equal to yield stress

~~(C) less than yield stress~~ *कम से कम प्रतिबल*
 (D) more than yield stress

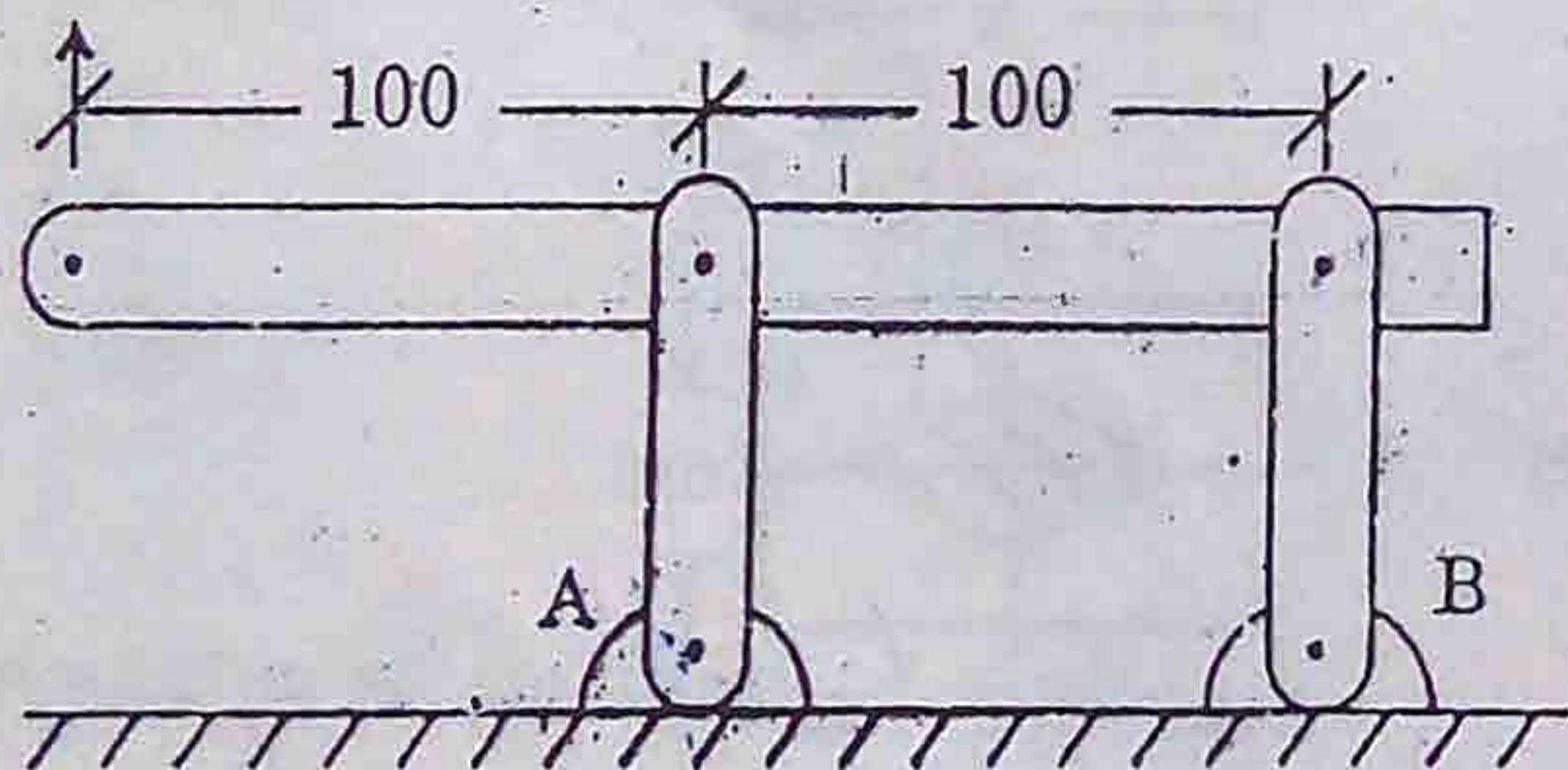
158. The relationship between Young's modulus, E, shear modulus, G, and Poisson's ratio, ν , is given by

~~(A) $G = \frac{E}{2(1+\nu)}$~~ (B) $E = \frac{G}{2(1+\nu)}$

(C) $G = \frac{E}{2(1-\nu)}$ (D) $E = \frac{G}{(1+\nu)}$

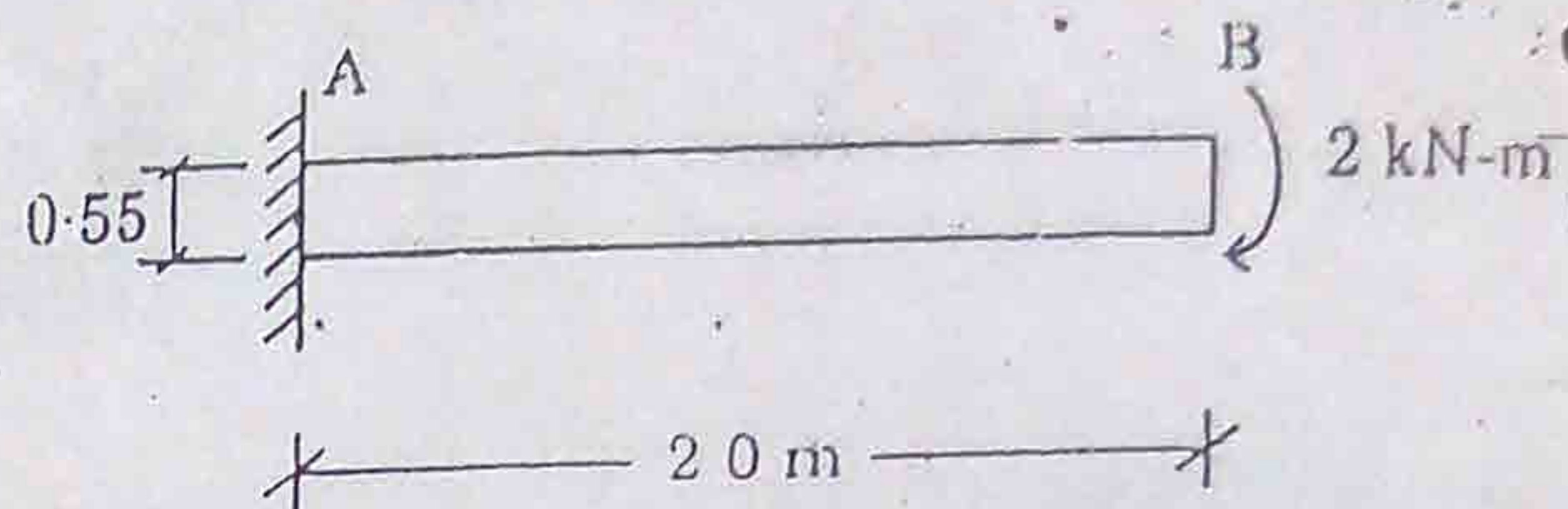
159. Reaction at support A is

20 kN



- (A) 40 kN downward
 (B) 40 kN upward
~~(C) 20 kN upward~~
 (D) 20 kN downward

160.



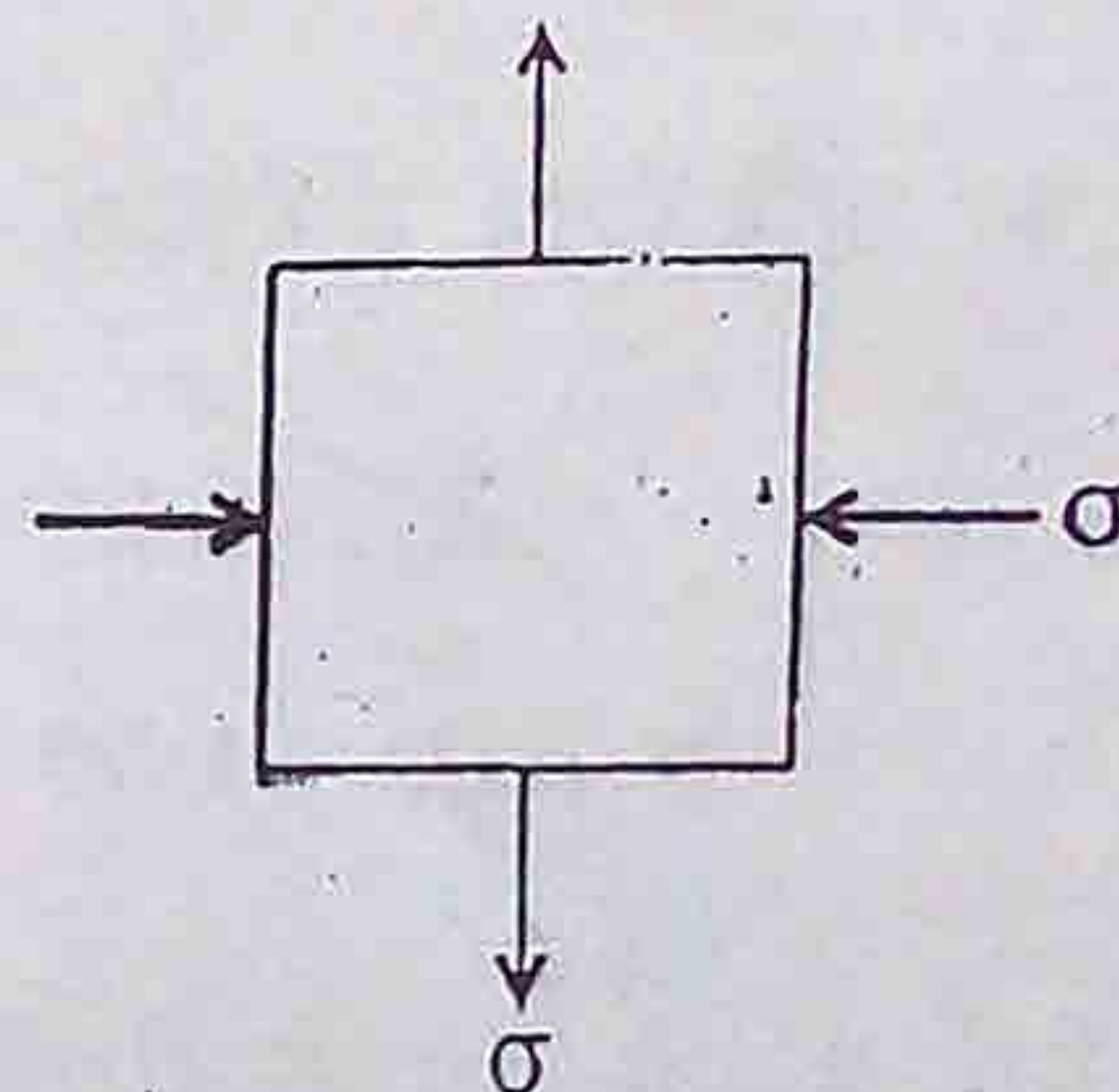
For the above cantilever beam, the absolute value of shear force at A is

- (A) 1.0 kN (B) 4.0 kN
~~(C) 0 kN~~ (D) 2.0 kN

161. The angle between the principal plane and the plane of maximum shear is

- ~~(A) 45°~~ (B) 90°
 (C) 135° (D) 60°

162.



For such element only under normal stresses the radius of Mohr circle is

- ~~(A) σ~~ (B) 2σ
 (C) 2σ (D) 0.5σ

163. The modulus of elasticity of steel is more than that of concrete. It indicates that steel is

- ~~(A) less elastic~~ (B) more elastic
 (C) more plastic (D) less plastic

164. Maximum shear stress produced in a solid circular shaft under torque is

- (A) $\frac{16T}{\pi D^3}$ (B) $\frac{16T}{\pi D^2}$
 (C) $\frac{32T}{\pi D^3}$ (D) $\frac{32T}{\pi D^2}$

165. Identify which grade of cement is *not* available in Indian market.

- (A) 23 grade (B) 33 grade
 (C) 43 grade (D) 53 grade

166. Rapid setting cement contains relatively higher proportion of

- (A) C_3S (B) C_2S
 (C) C_3A (D) C_4AF

167. The maximum deflection of tip of cantilever beam with concentrated load P at the free end is

- (A) $\frac{Pl^3}{3EI}$ (B) $\frac{Pl^3}{8EI}$
 (C) $\frac{Pl^3}{12EI}$ (D) $\frac{Pl^3}{24EI}$

168. To obtain high compressive strength of cement at

- (A) very slow rate [$1200^\circ C \xrightarrow{30 \text{ minutes}}$
 $500^\circ C \xrightarrow{20 \text{ minutes}}$ Ambient temperature]
 (B) slow rate [$1200^\circ C \xrightarrow{20 \text{ minutes}}$
 $500^\circ C \xrightarrow{15 \text{ minutes}}$ Ambient temperature]
 (C) moderate rate [$1200^\circ C \xrightarrow{15 \text{ minutes}}$
 $500^\circ C \xrightarrow{10 \text{ minutes}}$ Ambient temperature]
 (D) fast rate [$1200^\circ C \xrightarrow{10 \text{ minutes}}$
 $500^\circ C \xrightarrow{5 \text{ minutes}}$ Ambient temperature]

169. Find the *wrong* statement.

- In Le Chatelier's apparatus we
 (A) estimate expansion potential of cement.
 (B) estimate presence of magnesia in cement.
 (C) estimate presence of free lime in cement.
 (D) adopt 0.78 times the standard consistency of water.

170. Find the odd entry among silica fume, rice husk ash, metakaoline and ground granulated blast furnace slag with respect to cement production.

- (A) Silica fume
 (B) Rice husk ash
 (C) Metakaoline
 (D) Ground granulated blast furnace slag

171. To estimate 28 day crushing strength of concrete cubes from 7 day cube strength, we multiply the 7 day cube strength by

- (A) 3 (B) 2.5
 (C) 1.5 (D) 1.2

172. According to IS : 383, the coarsest sand falls under grading zone

- (A) I (B) II
 (C) III (D) IV

173. The initial setting time of fresh concrete should be

- (A) lower than 15 minutes
 (B) greater than 30 minutes
 (C) greater than 1 hour
 (D) not more than 10 hours



$\frac{1}{2} \times wl \times l$
 $wl \times \frac{1}{2} l$
 $\frac{wl^2}{2}$

174. All R.C. columns must be designed for a minimum eccentricity of

- (A) $l/50 + D/3$ (B) $l/25 + D/30$
 (C) $l/500 + D/30$ (D) $l/30 + D/500$

175. The thermal expansion coefficient (α) of steel is

- (A) $13 \times 10^{-6}/^{\circ}\text{C}$ and closely resembles to α of concrete
(B) $11 \times 10^{-6}/^{\circ}\text{C}$ and differs widely from α of concrete
 (C) $12 \times 10^{-6}/^{\circ}\text{C}$ and close to α of concrete
(D) $14 \times 10^{-6}/^{\circ}\text{C}$ but nearly equal to α of concrete

176. Maximum spacing of longitudinal bars measured along the periphery of the RC column shall not exceed

- (A) 200 mm
(B) 250 mm
 (C) 300 mm
(D) 20 times dia. of longitudinal bar

177. The tensile strength of concrete in flexure as per IS : 456 is

- (A) $0.6 \sqrt{f_{ck}}$ (B) $0.7 \sqrt{f_{ck}}$
(C) $0.75 \sqrt{f_{ck}}$ (D) $0.9 \sqrt{f_{ck}}$

where f_{ck} is the characteristic strength of concrete.

178. Low workability of concrete conforms to a slump of

- (A) 25 - 75 mm (B) 50 - 100 mm
(C) 75 - 100 mm (D) 100 - 150 mm

179. For mild and moderate exposures, if 20 mm down coarse aggregates are used, minimum cement content per cubic metre of concrete must not be less than

- (A) 280 kg (B) 300 kg
(C) 320 kg (D) 340 kg

180. The bond strength of concrete increases with

- (A) the quantity of steel
(B) the tensile strength of steel
 (C) the grade of concrete
(D) the quantity of concrete

181. The increased rate of strength gain of rapid hardening cement is achieved by

- (A) higher content of C_3S
(B) higher content of C_3A
(C) higher content of C_4AF
(D) higher content of C_2S

182. Bulking of sand is maximum if the percentage of moisture content is of the order of

- (A) 5 (B) 8
(C) 10 (D) 15

183. Study the following statements :

I. For constant w/c ratio, finer sand decreases the workability.

II. Creep is the deformation of concrete under sustained loading.

The correct statement(s) is/are

- (A) only I
 (B) only II
 (C) Both I and II

(D) None of I and II is true

184. Total pressure on the vertical face of a retaining wall of height h , per unit run exerted by the retained earth weighing w per unit volume and angle of repose ϕ is given by

(A) $wh \frac{1 - \sin \phi}{1 + \sin \phi}$

(B) $wh^2 \frac{1 - \sin \phi}{1 + \sin \phi}$

~~(C)~~ $\frac{wh^2}{2} \frac{1 - \sin \phi}{1 + \sin \phi}$

(D) $\frac{wh^2}{3} \frac{1 - \sin \phi}{1 + \sin \phi}$

185. According to IS : 456 - 2000, side-face reinforcement should be provided when depth of web of a beam exceeds

(A) 650 mm (B) 700 mm

(C) 725 mm ~~(D) 750 mm~~

186. If a beam fails in bond then its bond strength can be increased most economically by

(A) increasing the depth of beam

~~(B)~~ using thinner bars but more in number

(C) using thicker bars but less in number

(D) providing vertical stirrups

187. A flat slab is supported on

(A) beams

~~(B)~~ columns

(C) walls

(D) columns monolithically built with slab

188. The minimum cover in a slab should neither be less than the diameter of bar nor less than

(A) 10 mm

(B) 13 mm

~~(C)~~ 20 mm

(D) 25 mm

189. Maximum spacing of side face reinforcement of beams having depth of web more than 750 mm is

~~(A)~~ 300 mm

~~(B)~~ width of web of the beam

~~(C)~~ smaller of A & B

(D) greater of A & B

190. The modulus of rupture of concrete gives

~~(A)~~ the direct tensile strength of the concrete

(B) the direct tensile strength of the concrete

(C) the compressive strength of concrete under

(D) the indirect tensile strength of concrete

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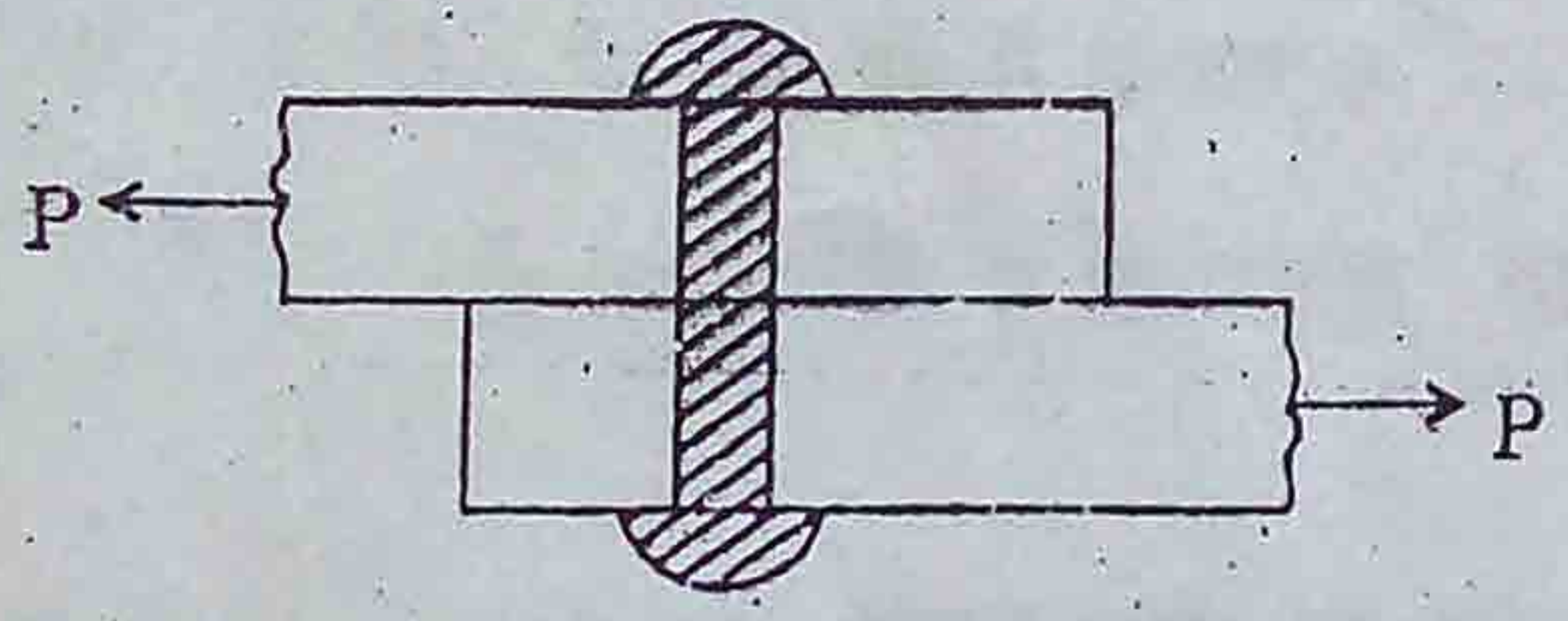
6	8
16	48
24	384

191. The gross diameter of rivet (hole) for a rivet with nominal diameter of 27 mm is
 (A) 28 mm (B) 28.5 mm
 (C) 29 mm (D) 29.5 mm

192. The maximum permissible stress in shear for power driven shop rivet is
 (A) 80 N/mm² (B) 90 N/mm²
 (C) 100 N/mm² (D) 250 N/mm²

193. As per IS : 800 - 1984, the lacings of compression member shall be proportioned to resist a total transverse shear 'S' equal to at least
 (A) 1.0% of axial load
 (B) 2.0% of axial load
 (C) 2.5% of axial load
 (D) 3.0% of axial load

194. If a 2 cm diameter rivet connects two plates as shown below and safe shear stress for rivet is 1000 kg/cm² the value of maximum permissible pull will be



- (A) 1100 kg (B) 1140 kg
 (C) 2140 kg (D) 3140 kg

195. According to IS : 800 - 1984, the permissible stress in axial tension in steel is
 [f_y = minimum yield stress of steel]
 (A) 0.56 f_y (B) 0.66 f_y
 (C) 0.70 f_y (D) 0.8 f_y

196. When two plates are placed end-to-end and are joined by two cover plates, the joint is known as

- (A) lap joint
 (B) butt joint
 (C) chain rivetted lap joint
 (D) double cover butt joint

197. As per codal provisions, the effective buckling length of a cantilever steel column of length L is given by

- (A) 0.5 L (B) 1.8 L
 (C) 2 L (D) 3 L

198. Diameter of a rivet hole should be greater than the nominal diameter of rivet by about

- (A) 4 to 5 mm (B) 2.5 to 4 mm
 (C) 1.5 to 2 mm (D) 0 to 1.5 mm

199. Bearing stiffeners in plate girder are provided at

- (A) mid span
 (B) equal interval
 (C) supports
 (D) neutral axis

20 + 1.5

200. The outstanding length of stiffener in terms of the thickness of the web is

- (A) 6 t
 (B) 8 t
 (C) 10 t
 (D) 12 t

SPACE FOR ROUGH WORK

Handwritten calculations for bending stress and deflection:

$$\sigma_{BA} = \frac{WL}{2EL}, \sigma_{B^A} = \frac{Ml^2}{2EL}$$

$$\sigma_{BA} = \frac{WL^2}{2EL}, \Delta = \frac{WL^3}{3EL}$$

$$\sigma_{BA} = \frac{WL^3}{6EL}, \frac{WL^4}{8EL}$$

$$\sigma_{BA} = \frac{WL^2}{2EL}, \frac{WL^3}{8EL}$$

Other notes include: $\sigma = \frac{1}{5} \times \frac{WL^3}{380EL}$, $\sigma = 2$, and $\sigma = \frac{\Delta d^2}{4} \times 2$.