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1029998

BH 2013
PAPER I
प्रश्न-पत्र I

Test Form No.
टेस्ट फॉर्म सं.
777 TG 8

Time Allowed : 2 Hours
निर्धारित समय : 2 घंटे

Maximum Marks : 200
अधिकतम अंक : 200

Read the following instructions carefully before you begin to answer the questions. This Booklet contains questions in English as well as in Hindi.
प्रश्नों के उत्तर देने से पहले नीचे लिखे अनुदेशों को ध्यान से पढ़ लें । इस पुस्तिका में प्रश्न अंग्रेज़ी तथा हिन्दी दोनों में दिये गये हैं ।

INSTRUCTIONS TO CANDIDATES

1. This Booklet contains 200 questions in all comprising the following three tests :
   Test (i) : General Intelligence and Reasoning (50 Questions)
   Test (ii) : General Awareness (50 Questions)
   Test (iii) : Part – A : General Engineering (Civil and Structural) (100 Questions)
   OR
   Part – B : General Engineering (Electrical) (100 Questions)
   OR
   Part – C : General Engineering (Mechanical) (100 Questions)
2. In questions set bilingually in English and Hindi, in case of discrepancy, the English version will prevail.
3. Test-I General Intelligence and Reasoning and Test-II General Awareness are compulsory for all the candidates. Candidates are required to attempt only one Section in Test-III General Engineering i.e. Part A Civil and Structural OR Part B Electrical OR Part C Mechanical as per option in the application form given by the candidates failing which you will be awarded *'ZERO'* mark.
4. All questions are compulsory and carry equal marks.
5. *The paper carries negative marking. 0·25 marks will be deducted for each wrong answer.*
6. **Before you start to answer the questions you must check up this Booklet and ensure that it contains all the pages (1-80) and see that no page is missing or repeated. If you find any defect in this Booklet, you must get it replaced *immediately*.**
7. You will be supplied the Answer-Sheet separately by the Invigilator. Before you actually start answering the questions, you must complete and code the details of *Name, Roll Number, Ticket Number, Name of the examination as mentioned in the admission certificate, Date of birth, Test Form Number and Stream* i.e. Civil and Structural OR Electrical OR Mechanical etc., on Side-I of the Answer-Sheet carefully. You must also put your signatures and left hand thumb impression on the Answer-Sheet at the prescribed place before you start answering the questions. These instructions must be fully complied with, failing which, your Answer-Sheet will not be evaluated and you will be awarded *'ZERO'* mark.
8. Answers must be shown by completely blackening the corresponding ovals on Side-II of the Answer-Sheet against the relevant question number by Black/Blue Ball-point Pen only. Answers which are not shown by Black/Blue Ball-point Pen will not be awarded any mark.
9. A machine will read the coded information in the OMR Answer-Sheet. In case the information is incomplete or different from the information given in the application form, such candidate will be awarded 'ZERO' mark.
10. The Answer-Sheet must be handed over to the Invigilator before you leave the Examination Hall.
11. **Failure to comply with any of the above instructions will render a candidate liable to such action/penalty as may be deemed fit.**
12. The manner in which the different questions are to be answered has been explained at the back of this Booklet (Page No. 80), which you should read carefully before actually answering the questions.
13. Answer the questions as quickly and as carefully as you can. Some questions may be difficult and others easy. Do not spend too much time on any question.
14. **No rough work is to be done on the Answer-Sheet. Space for rough work has been provided below the questions.**
15. **"Mobile phones and wireless communication devices are completely banned in the examination halls/rooms. Candidates are advised not to keep mobile phones/any other wireless communication devices with them even switching it off, in their own interest. Failing to comply with this provision will be considered as using unfair means in the examination and action will be taken against them including cancellation of their candidature."**

उम्मीदवारों के लिए अनुदेश

1. इस पुस्तिका में कुल 200 प्रश्न हैं, जिनमें निम्नलिखित तीन परीक्षण शामिल हैं :
   परीक्षण (i) : सामान्य बुद्धि और तर्क (50 प्रश्न)
   परीक्षण (ii) : सामान्य जानकारी (50 प्रश्न)
   परीक्षण (iii) : भाग – क : सामान्य इंजीनियरी (सिविल एवं संरचनात्मक) (100 प्रश्न)
   , अथवा
   भाग – ख : सामान्य इंजीनियरी (विद्युत) (100 प्रश्न)
   अथवा
   भाग – ग : सामान्य इंजीनियरी (यांत्रिक) (100 प्रश्न)
2. अंग्रेज़ी और हिन्दी भाषा में तैयार किए गए द्विभाषी प्रश्नों में कोई विसंगति होने की स्थिति में अंग्रेज़ी विवरण मान्य होगा ।
3. परीक्षण-I सामान्य बुद्धि और तर्क एवं परीक्षण-II सामान्य जानकारी सभी उम्मीदवारों के लिए अनिवार्य है । उम्मीदवारों को आवेदन-पत्र में दिए विकल्प के अनुसार परीक्षण-III सामान्य इंजीनियरी का केवल एक ही भाग-क सिविल एवं संरचनात्मक अथवा भाग-ख वैद्युत अथवा भाग-ग यांत्रिक को हल करना होगा अन्यथा आपको *'शून्य'* अंक दिया जाएगा ।
4. सभी प्रश्न अनिवार्य हैं तथा सबके बराबर अंक हैं ।
5. *प्रश्न पत्र में नकारात्मक अंकन होगा । हर ग़लत उत्तर के लिए 0·25 अंक काटा जाएगा ।*
6. **प्रश्नों के उत्तर देने से पहले आप इस पुस्तिका की जाँच करके देख लें कि इसमें कुल पृष्ठ (1-80) हैं तथा कोई पृष्ठ कम या दुबारा तो नहीं आ गया है ; यदि आप इस पुस्तिका में कोई त्रुटि पाएँ, तो *तत्काल* इसके बदले दूसरी पुस्तिका ले लें ।**
7. निरीक्षक द्वारा आपको उत्तर-पत्रिका अलग से दी जाएगी । प्रश्नों के उत्तर वास्तव में शुरू करने से पहले आप उत्तर-पत्रिका के Side-I में निर्देशावली के अनुसार अपना *नाम, रोल नम्बर, टिकट नम्बर, परीक्षा का नाम जैसे प्रवेश पत्र में दिखाया गया है, जन्म तिथि, टेस्ट फॉर्म संख्या तथा विषय* अर्थात् सिविल एवं संरचनात्मक या विद्युत या यांत्रिक आदि अवश्य लिखें । प्रश्नों के उत्तर देने से पहले उत्तर-पत्रिका पर निर्धारित स्थान में आप अपने हस्ताक्षर एवं बाएँ हाथ के अंगूठे का निशान भी अवश्य लगाएँ । उपर्युक्त अनुदेशों का पूरी तरह अनुपालन किया जाए, अन्यथा आपकी उत्तर-पत्रिका को जाँचा नहीं जाएगा और *'शून्य'* अंक दिया जाएगा ।
8. उत्तर-पत्रिका में सभी उत्तर Side-II में प्रश्न संख्या के सामने दिये गये सम्बन्धित अण्डाकार खानों को केवल काला/नीला बॉल-पॉइंट पेन से पूरी तरह काला करके दिखाएँ । जो अण्डाकार खाने काला/नीला बॉल-पॉइंट पेन से नहीं भरे जाएँगे, उनके लिए कोई अंक नहीं दिया जाएगा ।
9. ओ.एम.आर. उत्तर-पत्रिका में भरी गई कूट सूचना को एक मशीन पढ़ेगी । यदि सूचना अपूर्ण है अथवा आवेदन प्रपत्र में दी गई सूचना से भिन्न है, तो ऐसे अभ्यर्थी को 'शून्य' अंक दिया जाएगा ।
10. परीक्षा-भवन छोड़ने से पहले परीक्षार्थी को उत्तर-पत्रिका निरीक्षक के हवाले कर देनी चाहिए ।
11. **ऊपर के अनुदेशों में से किसी एक का भी पालन न करने पर उम्मीदवार पर नियमानुसार कार्यवाही की जा सकती है या दण्ड दिया जा सकता है ।**
12. विभिन्न प्रश्नों के उत्तर देने की विधि इस पुस्तिका के पीछे (पृष्ठ संख्या 80) में छपे हुए निर्देशों में दे दी गई है, इसे आप प्रश्नों के उत्तर देने से पहले ध्यानपूर्वक पढ़ लें ।
13. प्रश्नों के उत्तर जितनी जल्दी हो सके तथा ध्यानपूर्वक दें । कुछ प्रश्न आसान तथा कुछ कठिन हैं । किसी एक प्रश्न पर बहुत अधिक समय न लगाएँ ।
14. **कोई रफ़ कार्य उत्तर-पत्रिका पर नहीं करना है । रफ़ कार्य के लिए स्थान प्रश्नों के नीचे दिया गया है ।**
15. **"परीक्षा हालों/कक्षों में मोबाइल फोन तथा बेतार संचार साधन पूरी तरह निषिद्ध हैं । उम्मीदवारों को उनके अपने हित में सलाह दी जाती है कि मोबाइल फोन/किसी अन्य बेतार संचार साधन को स्विच ऑफ करके भी अपने पास न रखें । इस प्रावधान का अनुपालन न करने को परीक्षा में अनुचित उपायों का प्रयोग माना जाएगा और उनके विरुद्ध कार्रवाई की जाएगी, उनकी अभ्यर्थिता रद्द कर देने सहित ।"**

SEAL

TEST (iii)
PART – A : GENERAL ENGINEERING
(CIVIL AND STRUCTURAL)

101. The base material for distemper is

(A) Chalk
(B) Lime
(C) Clay
(D) Lime putty

102. The amount of water used in performing setting time test of cement is (assuming p = standard consistency of cement)

(A) 0·60 p (B) 0·65 p
(C) 0·80 p (D) 0·85 p

103. Gypsum used in cement manufacturing acts as

(A) accelerator
(B) air entraining agent
(C) plasticizer
(D) retarder

104. The woodworks should be measured to nearest

(A) 0·001 m
(B) 0·002 m
(C) 0·003 m
(D) 0·004 m

105. Anti-siphonage pipe is connected to

(A) Main soil pipe
(B) Bottom of P trap W.C.
(C) Top of P trap W.C.
(D) Side of Water Closet

106. For 15 mm thick cement plastering 1 : 6 on 100 sq.m. new brick work, the quantity of cement required is

(A) 0·200 m^3 (B) 0·247 m^3
(C) 0·274 m^3 (D) 0·343 m^3

107. The most suitable stone for building piers is

(A) granite (B) limestone
(C) marble (D) sandstone

108. Number of modular bricks required for one cubic metre of brick masonry are

(A) 400 (B) 450
(C) 550 (D) 500

109. The plasticity to mould bricks in suitable shape is contributed by

(A) Alumina (B) Lime
(C) Magnesia (D) Silica

110. The crushing strength of a first class brick is

(A) 3 N/mm^2 (B) 5·5 N/mm^2
(C) 10·5 N/mm^2 (D) 7·5 N/mm^2

111. Which of the following cements is suitable for use in urgent repairs of existing massive concrete structures such as large dams ?

(A) Ordinary portland cement
(B) Low heat cement
(C) Rapid hardening cement
(D) Sulphate resisting cement

112. For polishing mosaic floors we use

(A) Carbolic acid (B) Muriatic acid
(C) Acetic acid (D) Oxalic acid

113. The lintels are preferred to arches because

(A) arches require more headroom to span the openings like doors, windows, etc.
(B) arches require strong abutments to withstand arch thrust
(C) arches are difficult in construction
(D) All of the above

114. Ranging is defined as

(A) measuring the distance from starting point

(B) establishing intermediate points on a chain line

(C) the distance between end points

(D) a point on a chain line

115. Compute the angle between the lines AB and AC, If their respective bearings are 52°30′ and 328°45′.

(A) 276°15′ (B) 6°15′

(C) 111°15′ (D) 83°45′

116. The Whole Circle Bearing of a line is 287°15′. The Reduced Bearing of the line is

(A) S 107°15′ W (B) S 17°15′ W

(C) N 72°45′ W (D) S 107°15′ E

117. A line joining some fixed points on the main survey lines is called

(A) check line (B) tie line

(C) chain line (D) base line

118. Which of the following methods of contouring is most suitable for hilly terrain?

(A) Direct method

(B) Square method

(C) Cross-section method

(D) Tacheometric method

119. A level line is a

(A) line parallel to the mean spheroidal surface of the earth

(B) line passing through centre of cross hairs and centre of eye-piece

(C) line passing through objective lens and the eye-piece

(D) horizontal line

120. If 'i' is the rate of interest expressed in decimal and 'n' is the number of years, then coefficient of annual sinking find, I_e is

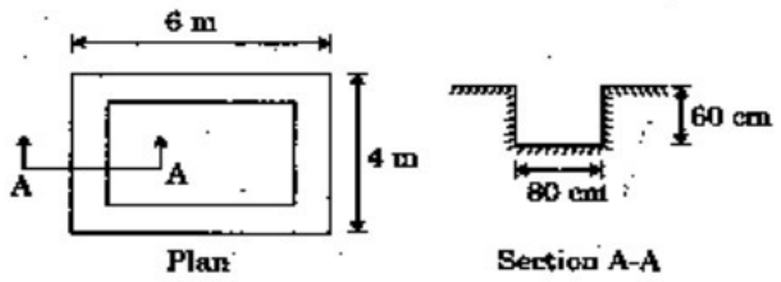
(A) $I_e = \frac{[(1+i)^n - 1]}{(1+i) - 1}$

(B) $I_e = \frac{i}{(1+i)^n - 1}$

(C) $I_e = \frac{i}{(1-i)^n + 1}$

(D) $I_e = \frac{i}{(1+i)^n + 1}$

121.



The above figure represents plan and section of an excavation layout. The volume of earthwork in excavation of foundation trench is

(A) 6·528 cu.m. (B) 8·064 cu.m.

(C) 8·832 cu.m. (D) 9·600 cu.m.

122. If d be the diameter of MS or tor steel bars in mm, the standard weight (in kg) per metre of the bar is

(A) $0{\cdot}00618\ d^2$

(B) $0{\cdot}00618\ d$

(C) $0{\cdot}00816\ d^2$

(D) $0{\cdot}00816\ d$

123. The main principle of field surveying is to work from

(A) higher level to lower level

(B) lower level to higher level

(C) part to whole

(D) whole to part

124. Sand particles are made of

(A) Kaolinite
(B) Illite
(C) Montmorillonite
(D) Quartz

125. A shallow foundation is defined as a foundation which

(A) has low bearing capacity
(B) has a depth of embedment less than its width
(C) is resting on the ground surface
(D) causes less settlement

126. If the volume of voids is equal to the volume of solids in a soil mass, then the values of porosity and voids ratio respectively are

(A) 1·0 and 0·0 (B) 0·0 and 1·0
(C) 1·5 and 1·0 (D) 1·0 and 0·5

127. The lime stabilization is very effective in treating

(A) Sandy soils
(B) Silty soils
(C) Non-plastic soils
(D) Plastic clayey soils

128. A 300 mm square bearing plate settles by 15 mm in a plate load test on a cohesive soil when the intensity of loading is 0·2 N/mm^2. The settlement of a prototype shallow footing 1 m square under the same intensity of loading is

(A) 15 mm (B) 30 mm
(C) 50 mm (D) 167 mm

129. The specific speed for a turbine has the dimensions of

(A) $F^{1/2} L^{-3/4} T^{-3/2}$
(B) T^{-1}
(C) $F^{1/2} L^{-5/2} T^{-3/2}$
(D) $F L^{-3/4} T^{-3/2}$

130. 'Offsets' are

(A) Lateral measurements from chain line
(B) Ties or check lines which are perpendicular to chain line
(C) Sets of minor measurements in chain surveying
(D) Chain lines which go out of alignment

131. The fore bearings of the lines AB and BC are 40° and 120° respectively. The included angle between AB and BC is

(A) 40° (B) 60°
(C) 80° (D) 100°

132. If the sum of northings of a traverse exceeds the sum of southings by 1 m and sum of eastings exceeds the sum of westings by 1 m, the resultant closing error and its true bearing are respectively,

(A) $\sqrt{2}$ m, N 45° E
(B) 1 m, N 45° E
(C) 2 m, N 45° W
(D) 2 m, N 45° E

133. If in a closed traverse, the sum of the north latitudes is more than the sum of the south latitudes and also the sum of west departures is more than the sum of east departures, the bearing of the closing line is in the

(A) SE quadrant
(B) NE quadrant
(C) NW quadrant
(D) SW quadrant

134. The angle between true meridian and the magnetic meridian at the time of observations is known as

(A) Orientation
(B) Magnetic declination
(C) Magnetic bearing
(D) Dip

135. A surge tank is provided in hydropower schemes to

(A) reduce water hammer pressures
(B) reduce frictional losses
(C) increase the net head
(D) strengthen the penstocks

136. In a two-dimensional flow of fluid, if a velocity potential function ϕ exists which satisfies the relation

$\frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} = 0$, then the flow is

(A) steady incompressible
(B) steady laminar and incompressible
(C) irrotational and incompressible
(D) turbulent and incompressible

137. Reynolds number is the ratio of the inertia force to the

(A) surface tension force
(B) viscous force
(C) gravity force
(D) elastic force

138. A river training work is generally required when the river is

(A) aggrading type
(B) meandering type
(C) degrading type
(D) both (A) and (C)

139. The water utilizable by plants is available in the form of

(A) gravity water
(B) hydroscopic water
(C) capillary water
(D) chemical water

140. Bulk modulus of a fluid is the ratio of

(A) shear stress to shear strain
(B) increase in volume to the viscosity of fluid
(C) increase in pressure to the volumetric strain
(D) critical velocity to the velocity of fluid

141. The buoyancy depends upon the

(A) pressure with which the liquid is displaced
(B) weight of the liquid displaced
(C) viscosity of the liquid
(D) compressibility of the liquid

142. The discharge over a rectangular notch is

(A) inversely proportional to $H^{3/2}$
(B) directly proportional to $H^{3/2}$
(C) inversely proportional to $H^{5/2}$
(D) directly proportional to $H^{5/2}$

143. The most economical section of a rectangular channel is one having hydraulic radius equal to

(A) twice the depth
(B) half the breadth
(C) half the depth
(D) twice the breadth

144. In a rectangular channel, the ratio of the specific energy at critical depth E_c to the critical depth y_c is

(A) 2·0 (B) 1·0
(C) 1·5 (D) 1·25

145. In open channel flows, the characteristic length commonly used in defining the Reynolds number is the

(A) depth of flow
(B) wetted perimeter
(C) hydraulic radius
(D) area/top width

146. A beam fixed at both ends carries a uniformly distributed load on entire length. The ratio of bending moment at the support to the bending moment at mid span is given by

(A) 0·5 (B) 1·0

(C) 1·5 (D) 2·0

147. In case of biaxial stress, the maximum value of shear stress is given by

(A) Difference of the normal stresses

(B) Half the difference of the normal stresses

(C) Sum of the normal stresses

(D) Half the sum of the normal stresses

148. From a circular plate of diameter 6·0 cm, a circle is cut out whose diameter is a radius of the plate. The distance of centre of gravity of the remainder from the centre of circular plate is

(A) 2·0 cm

(B) 1·5 cm

(C) 1·0 cm

(D) 0·5 cm

149. In a section undergoing pure bending, the neutral surface is subjected to

(A) compression strain

(B) tensile strain

(C) zero strain

(D) None of the above

150. The ability of a material to absorb energy till the breaking or rupture takes place is known as

(A) Hardness (B) Toughness

(C) Brittleness (D) Softness

151. At the point of contraflexure

(A) Bending moment is minimum

(B) Bending moment is maximum

(C) Bending moment is zero

(D) Bending moment is zero and its sign changes

152. If the stopping distance and average length of a vehicle are 18 m and 6 m respectively, then the theoretical maximum capacity (vehicles per hour) of a traffic lane at a speed of 10 m/sec is

(A) 1500 (B) 2000

(C) 2500 (D) 3000

153. In highway construction on superelevated curves, the rolling shall proceed from

(A) sides towards the centre

(B) centre towards the sides

(C) lower edge towards the upper edge

(D) upper edge towards the lower edge

154. The permissible limit of arsenic in drinking water as per the guidelines of WHO is

(A) 0·01 ppm

(B) 0·01 ppb

(C) 0·05 ppm

(D) 0·05 ppb

155. Which one of the following sequences is the most suitable for treating raw surface water to make it suitable for drinking purpose ?

(A) Screening → filtration → sedimentation → disinfection

(B) Screening → disinfection → sedimentation → filtration

(C) Screening → sedimentation → disinfection → filtration

(D) Screening → sedimentation → filtration → disinfection

156. The populations of a town as per census records were 200000, 210000 and 230000 for the years 1981, 1991 and 2001 respectively. The population of the town as per geometric mean method in the year 2009 is

(A) 244872 (B) 245872

(C) 246820 (D) None of the above

157. A simply supported beam is carrying distributed load of 'zero' intensity over one support to linearly varying nature of intensity 'w' over the other support. The shape of BMD will be

(A) linear

(B) parabolic

(C) cubical parabolic

(D) zero

158. The maximum dimension of a core section for a rectangular cross-section under eccentric loading on a column (b × d) is

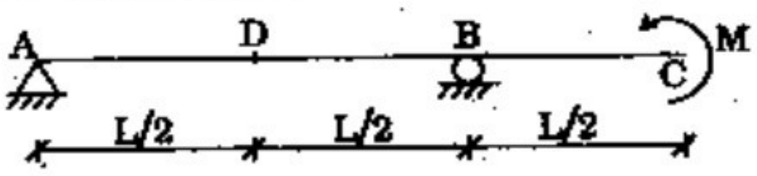
(A) b/6

(B) d/6

(C) d/8

(D) b/3 and d/3

159. Shear force at the mid-span point D in the following beam is



(A) zero (B) 2 M/L

(C) M/L (D) 3 M/L

160. Two identical simply supported beams of span 'ℓ' are subjected to equal load 'W'. One beam is carrying the load 'W' at its centre (as concentrated load) and the other one is carrying it in the form of u.d.l. over the entire span. The ratio of their mid-span bending moment will be

(A) $\frac{1}{2}$ (B) 2

(C) 4 (D) 8

161. In a Mohr's circle of σ – τ plane (σ = normal stress, τ = shear stress), the vertical diameter represents

(A) Maximum shear stress

(B) Maximum normal stress

(C) Principal stress

(D) Minimum normal stress

162. The shear diagram for a cantilever beam subjected to a concentrated load at the free end is given by a/an

(A) Triangle

(B) Rectangle

(C) Parabola

(D) Ellipse

163. Deflection of the free end of a cantilever beam having a concentrated load W at mid span is given by

(A) $WL^3/3\ EI$

(B) $5\ WL^3/24\ EI$

(C) $5\ WL^3/48\ EI$

(D) $WL^3/48\ EI$

164. Of the several prismatic beams of equal lengths and of same material, the beam that can carry maximum load in flexure is the one having maximum

(A) Depth of section

(B) Area of cross-section

(C) Section modulus

(D) Moment of inertia

165. The maximum deflection of a simply supported beam of effective span L and subjected to a central concentrated load W is given by

(A) $WL^3/8\ EI$

(B) $WL^3/24\ EI$

(C) $WL^3/48\ EI$

(D) $5\ WL^3/384\ EI$

166. A concentrated load W acts at the centre of a simply supported beam of length L. If the load is changed to a uniformly distributed load over the entire span, then the ratio of maximum deflection under concentrated load and under uniformly distributed load will be

(A) 1·2 (B) 1·3

(C) 1/4 (D) 8/5

167. The equivalent stiffness of two springs of stiffness S_1 and S_2 joined in series is given by $S =$

(A) $S_1 S_2 / (S_1 + S_2)$

(B) $(S_1/S_2)/(S_1 + S_2)$

(C) $S_1 + S_2$

(D) $S_1 S_2$

168. Buckling load for an axially loaded column with both ends fixed is given by

(A) $\pi^2 EI/l^2$ (B) $2\pi^2 EI/l^2$

(C) $4\pi^2 EI/l^2$ (D) $\pi^2 EI/(4l^2)$

169. Poisson's ratio μ is defined as the ratio of

(A) axial strain to transverse strain

(B) axial strain to shear strain

(C) transverse strain to axial strain

(D) shear strain to axial strain

170. In a thin cylindrical shell, the ratio of longitudinal stress to hoop stress is

(A) 0·5 (B) 1·0

(C) 1·5 (D) 2·0

171. The grade of concrete M 20 means that characteristic compressive strength of 15 cm cubes after 28 days is given by

(A) $10\ N/mm^2$ (B) $15\ N/mm^2$

(C) $20\ N/mm^2$ (D) $25\ N/mm^2$

172. You are asked to construct a massive concrete dam. The type of cement you will use is

(A) Ordinary portland cement

(B) Rapid hardening portland cement

(C) Low heat cement

(D) Blast furnace slag cement

173. The object of curing is *not* to

(A) prevent the loss of water by evaporation

(B) reduce the shrinkage of cement concrete

(C) preserve the properties of concrete

(D) reduce the strength of concrete

174. The initial setting time of Ordinary Portland Cement (OPC) is

(A) 10 min. (B) 30 min.

(C) 45 min. (D) 60 min.

175. A structure which offers negligible or zero resistance on bending at any point is known as

(A) Beam

(B) Girder

(C) Lintel

(D) Cable

176. The curvature at any point $\left(\frac{1}{R}\right)$ along the curve representing the deformed shape of a beam is given by

(A) $\pm (dy/dx) \Big/ \left[1 + \frac{d^2y}{dx^2}\right]^{1/2}$

(B) $\pm (d^2y/dx^2) \Big/ \left[1 + \left(\frac{dy}{dx}\right)^2\right]^{3/2}$

(C) $\pm (d^2y/dx^2) \Big/ \left[1 + \frac{d^2y}{dx^2}\right]^{1/2}$

(D) $\pm (dy/dx) \Big/ \left[1 + \frac{d^2y}{dx^2}\right]^{2}$

177. The moment required to rotate the near end of a prismatic beam through unit angle, without translation, the far end being fixed is

(A) EI/L (B) 2 EI/L

(C) 3 EI/L (D) 4 EI/L

178. A retaining wall of trapezoidal section having base width 'b' retains earth at its back. For no tension to be developed at base, the resultant force will intersect the base from centre line of the base, within a distance of

(A) b/3 (B) b/4

(C) b/5 (D) b/6

179. Angle of twist of a circular shaft under the action of a torsional moment T is given by

(A) GJ/TL (B) TL/GJ

(C) TJ/GL (D) TG/JL

180. During the manufacture of Portland cement, gypsum or Plaster of Paris is added to
(A) increase the strength of cement
(B) modify the colour of cement
(C) reduce heat of hydration of cement
(D) adjust setting time of cement

181. Minimum percentage of tension steel in an RCC beam for Fe 500 steel is
(A) 0·12 (B) 0·17
(C) 0·22 (D) 0·80

182. As per IS 456, the effective length of cantilever shall be taken as
(A) clear span
(B) clear span + effective depth/2
(C) clear span + effective depth
(D) clear span + effective width

183. If the modular ratio is 'm', stress ratio in steel and concrete is 'r', then the critical neutral axis constant 'k' is given by
(A) $m/(m-r)$ (B) $m/(m+r)$
(C) $(m+r)/m$ (D) m^2/r

184. For two way action, i.e. punching shear, the calculated shear stress, τ_v, should satisfy the following relation $\tau_v \le k_s\tau_c$, where τ_c according to working stress method is expressed as
(A) $0{\cdot}1\sqrt{f_{ck}}$ (B) $0{\cdot}16\sqrt{f_{ck}}$
(C) $0{\cdot}25\sqrt{f_{ck}}$ (D) $0{\cdot}4\sqrt{f_{ck}}$

185. The minimum horizontal distance between two main reinforcement bars should be
(A) diameter of larger bar or 5 mm more than the nominal maximum size of coarse aggregate, whichever is higher
(B) 5 mm more than the nominal size of the aggregate only
(C) 5 mm more than the diameter of the bar
(D) None of the above

186. High percentage of C_3S and low percentage of C_2S in a cement will result in
(i) rapid hardening
(ii) high early strength with high heat generation
(iii) more resistance to chemical attack
The correct answer is
(A) Only (i)
(B) Only (iii)
(C) Both (i) and (ii)
(D) Both (ii) and (iii)

187. As per IS 456, splitting tensile strength (f_{cr}) of concrete may be estimated from compressive strength as
(A) $f_{cr} = 0{\cdot}65\sqrt{f_{ck}}$
(B) $f_{cr} = 0{\cdot}7\sqrt{f_{ck}}$
(C) $f_{cr} = 0{\cdot}75\sqrt{f_{ck}}$
(D) $f_{cr} = 0{\cdot}8\sqrt{f_{ck}}$

188. Maximum admissible water-cement ratio for mild environmental exposure should be
(A) 0·55 (B) 0·50
(C) 0·45 (D) 0·40

189. Air entrainment in the concrete increases
(A) workability
(B) strength
(C) the effect of temperature variation
(D) the unit weight

190. Which of the following is added for quick setting of cement ?
(A) Gypsum
(B) Alum
(C) Zinc sulphate
(D) Aluminium sulphate

191. The distance between two rivets measured perpendicular to the direction of applied force is known as

(A) pitch

(B) gauge

(C) staggered pitch

(D) edge distance

192. For simply supported beams, the allowable deflection shall *not* exceed

(A) 1/325 of span

(B) 1/350 of span

(C) 1/375 of span

(D) 1/400 of span

193. The beams supporting the stair steps, are generally known as

(A) headers

(B) trimmers

(C) stringers

(D) spandrel beam

194. Maximum size of a fillet weld for a plate of square edge is

(A) 1·5 mm less than the thickness of the plate

(B) one-half of the thickness of the plate

(C) thickness of the plate itself

(D) 1·5 mm more than the thickness of the plate

195. The minimum edge and end distance from the centre of any hole to the nearest flame-cut edge shall *not* be less than

(A) 1·5 times hole dia

(B) 1·7 times hole dia

(C) 2 times hole dia

(D) 1·5 times bolt / rivet dia

196. In a singly reinforced beam, if the permissible stress in concrete reaches earlier than the permissible stress in steel, the beam section is called

(A) Under reinforced section

(B) Over reinforced section

(C) Balanced section

(D) Economic section

197. If σ_s is the stress in bar and τ_{bd} is the design bond stress, then the development length of a bar of diameter ϕ is given by

(A) $\frac{4\phi\,\sigma_s}{\tau_{bd}}$ (B) $\frac{\phi\,\sigma_s}{4\tau_{bd}}$

(C) $\frac{2\phi\,\sigma_s}{3\tau_{bd}}$ (D) $\frac{\phi\,\sigma_s}{3\tau_{bd}}$

198. Side face reinforcement shall be provided in the reinforced concrete beam when depth of web in the beam exceeds

(A) 500 mm (B) 750 mm

(C) 1000 mm (D) 1200 mm

199. A cantilever retaining wall should *not* be used for heights more than

(A) 4 m (B) 6 m

(C) 8 m (D) 10 m

200. Diagonal tension in a reinforced concrete beam

(A) is maximum at neutral axis

(B) decreases below neutral axis and increases above neutral axis

(C) increases below neutral axis and decreases above neutral axis

(D) remains constant throughout the depth