Staff Selection Commission

Junior Engineer (Civil & Electrical) Exam - 2014

Held on 25-05-2014 Evening Session

PAPER - I

Time Allowed : 2 Hours | *Maximum Marks : 200*

निर्धारित समय : 2 घण्टे | *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 (1-64) 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 signature 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. 64), 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 [illegible]***

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 गए विकल्प के अनुसार परीक्षण-III सामान्य इंजीनियरी का केवल एक ही भाग-क सिविल एवं संरचनात्मक अथवा भाग-ख विद्युत 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 गलत 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 पूरे पृष्ठ (1-64) 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 लिखना शुरू करने से पहले आप उत्तर-पत्रिका के Side-I में नियमावली 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 विवेकानुसार 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 64) 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 पीछे दिया गया है।
15. ***"परीक्षा हॉलों/कमरों में मोबाइल फोन तथा बेतार संचार सा[illegible] निषिद्ध हैं। उम्मीदवारों को उनके अपने हित में सलाह दी***

TEST (i) : GENERAL INTELLIGENCE AND REASONING

Directions : *In questions no. 1 to 8, select the related word/letters/number from the given alternatives.*

1. Uttarakhand : Dehradun : : Mizoram : ?
   (A) Aizawl (B) Kohima
   (C) Shillong (D) Darjeeling

2. Crime : Court : : Disease : ?
   (A) Doctor (B) Medicine
   (C) Hospital (D) Treatment

3. YQXP : JBIA : : OVNU : ?
   (A) FAGZ (B) HRIS
   (C) DKCJ (D) DNEO

4. ADGJ : BEHK : : DGJM : ?
   (A) KPUB (B) GJMP
   (C) KNQT (D) PSVY

5. ACE : BDF : : GIK : ?
   (A) HJL (B) AXP
   (C) CFG (D) GFC

6. CAT : BIG : : DDY : ?
   (A) CLL (B) CLM
   (C) CML (D) CEP

7. 1 : 1 : : 10 : ?
   (A) 12 (B) 110
   (C) 210 (D) 1000

8. 7 : 56 : : 5 : ?
   (A) 25 (B) 26
   (C) 30 (D) 35

9. The following numbers fall in a group. Which one does ***not*** belong to the group ?
   53, 63, 83, 73
   (A) 53 (B) 63
   (C) 83 (D) 73

10. Which one is the same as Mumbai, Kolkata and Cochin ?
   (A) Delhi (B) Kanpur
   (C) Chennai (D) Sholapur

Directions : *In questions no. 11 to 17, find the odd word/letters/number pair from the given alternatives.*

11. (A) Kolkata (B) Vishakhapatnam
   (C) Bengaluru (D) Haldia

12. Carrot, Cabbage, Potato, Ginger, Beetroot
   (A) Cabbage (B) Carrot
   (C) Potato (D) Beetroot

13. (A) HGFE (B) PONM
   (C) DCBA (D) MSTU

14. (A) GFI (B) VUX
   (C) POR (D) LKM

15. (A) vwqp (B) yxmn
   (C) gfkl (D) cbrs

16. (A) (324, 18) (B) (441, 72)
   (C) (117, 81) (D) (186, 14)

17. (A) (11, 121) (B) (25, 625)
   (C) (12, 141) (D) (15, 225)

18. Find the smallest number which when divided by 25, 40 or 56 has in each case 13 as remainder
   (A) 1413 (B) 1400
   (C) 1439 (D) 1426

19. Arrange the following words as per order in the dictionary :
   1. Emplane 2. Empower
   3. Embrace 4. Elocution
   5. Equable
   (A) 5, 1, 3, 2, 4 (B) 4, 2, 1, 3, 5
   (C) 4, 3, 1, 2, 5 (D) 4, 5, 2, 3, 1

20. Which one of the given responses would be a meaningful order of the following words ?
   1. Sowing 2. Tilling
   3. Reaping 4. Weeding
   (A) 3, 1, 2, 4 (B) 2, 1, 4, 3
   (C) 1, 2, 4, 3 (D) 1, 3, 2, 4

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21. Arrange the colours of the rainbow (in the reverse order) (from the top edge) :

Red, Orange, ...

1. Blue
2. Indigo
3. Yellow
4. Green
5. Violet

(A) 3, 4, 1, 2, 5 (B) 4, 3, 2, 5, 1

(C) 5, 3, 4, 2, 1 (D) 2, 4, 3, 1, 5

Directions : *In questions no. 22 to 24, a series is given, with one term missing. Choose the correct alternative from the given ones that will complete the series.*

22. CEG, JLN, QSU, ?

(A) QQS (B) TVX

(C) HJL (D) UVW

23. B-1, D-2, F-4, H-8, J-16, ?

(A) K-64 (B) L-32

(C) M-32 (D) L-64

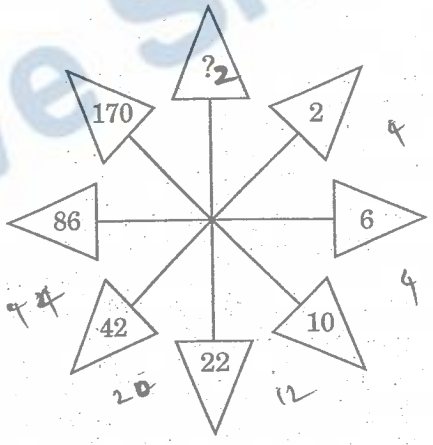
24. CGJ, KOR, TXA, ?

(A) ACE (B) JDP

(C) FJM (D) UWY

Directions : *In questions no. 25 to 29, find the missing number from the given responses.*

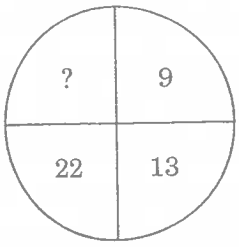
25.



(A) 422 (B) 374

(C) 256 (D) 342

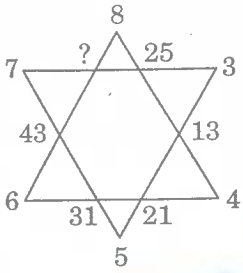
26.



(A) 40 (B) 38

(C) 39 (D) 44

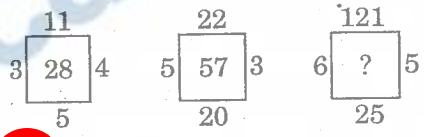
27.



(A) 56 (B) 57

(C) 58 (D) 59

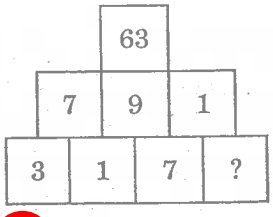
28.



(A) 176 (B) 115

(C) 157 (D) 131

29.



(A) 3 (B) 9

(C) 5 (D) 2

30. Arrange the letters to form a word and suggest what is it.

NGDEALN

(A) State (B) Country

(C) River (D) Ocean

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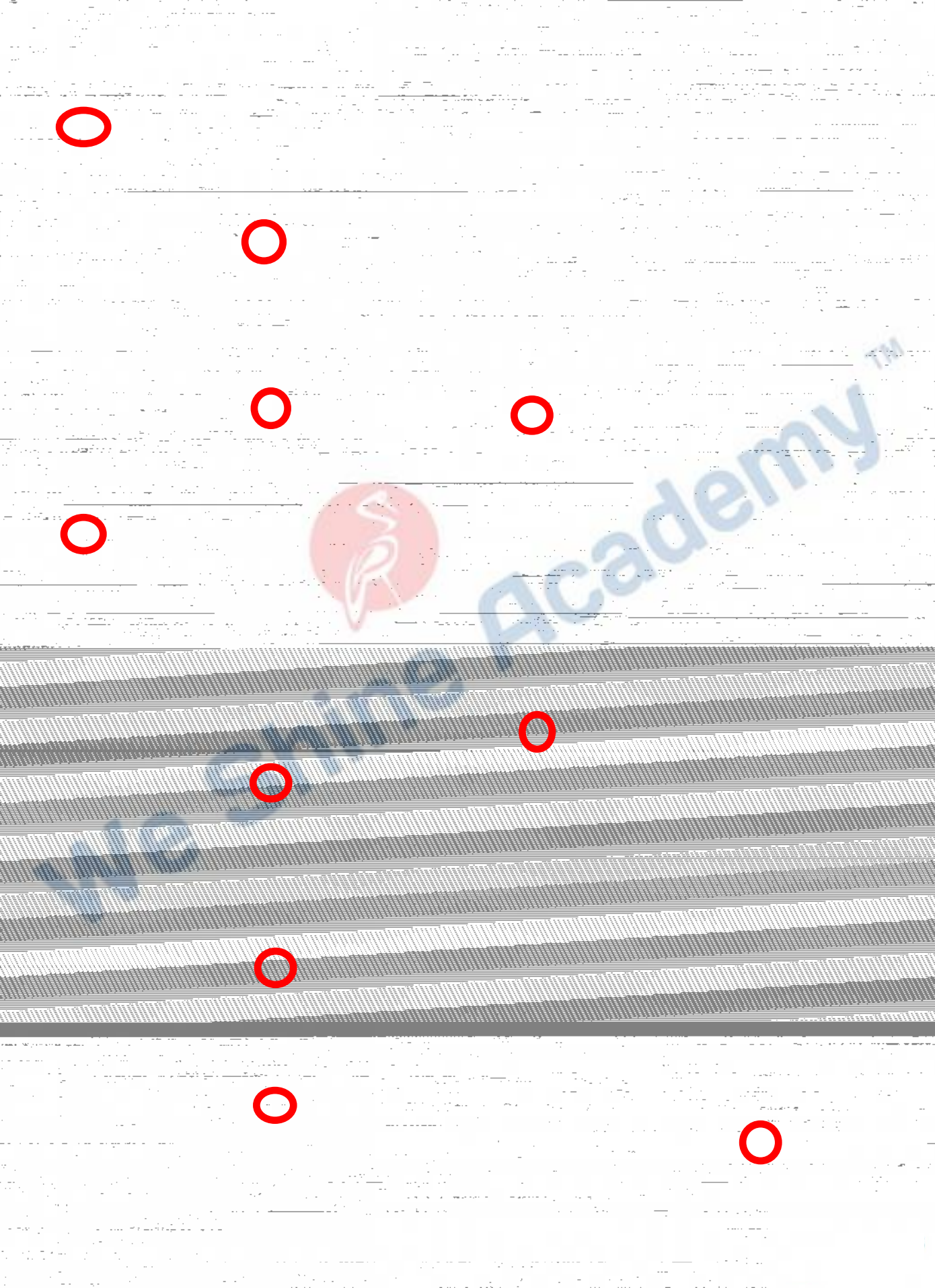

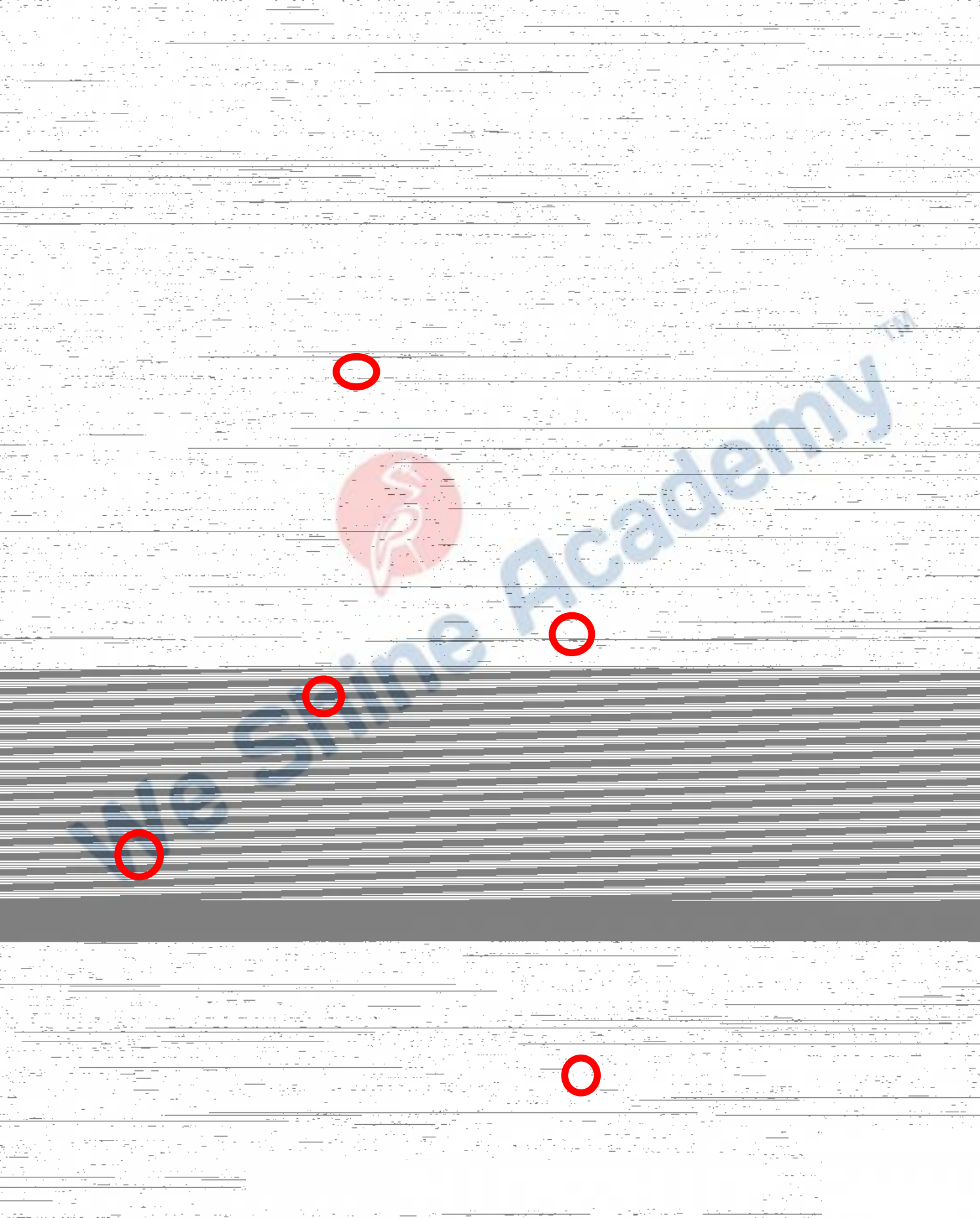

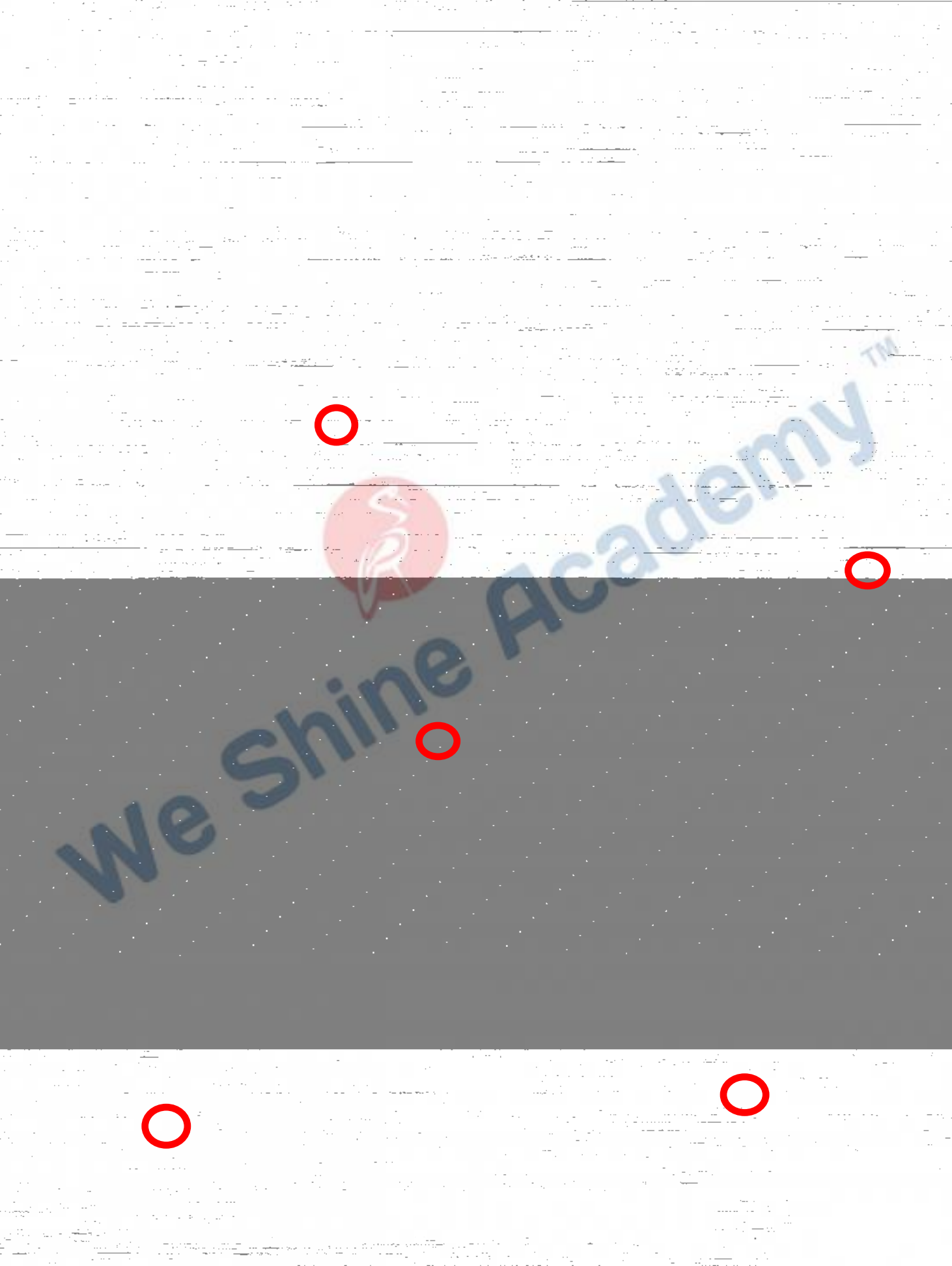
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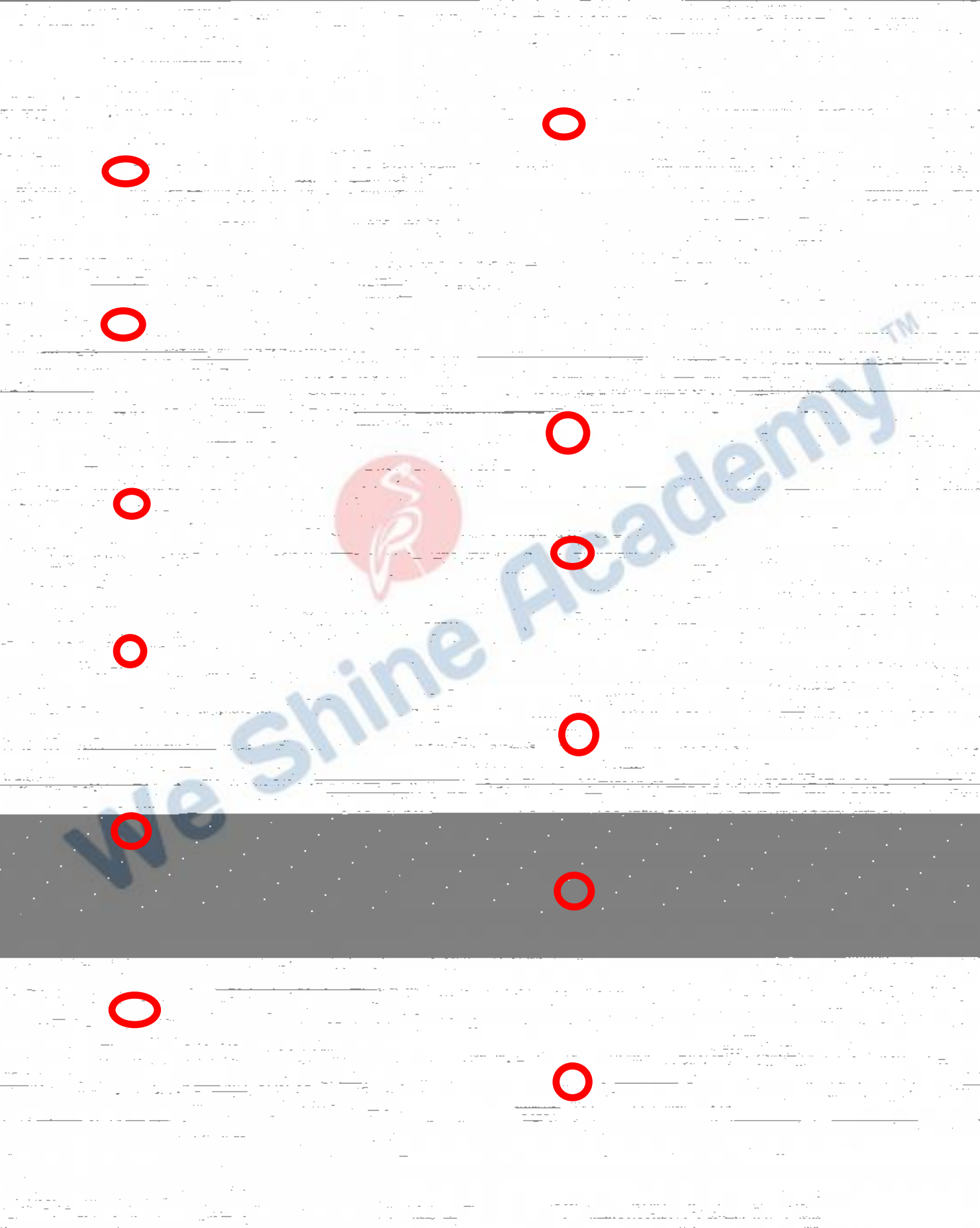
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63. The famous court poet of Akbar was

(A) Birbal

(B) Tulsidas

(C) Rahim Khan

(D) Bairam Khan

64. Who established four great Mathas at the four corners of India — Sringeri, Puri, Dwaraka and Badrinath ?

(A) Shankara (B) Ramanuja

(C) Madhva (D) Ramananda

65. The local name of Mohenjodaro is

(A) Mound of the living

(B) Mound of the great

(C) Mound of the dead

(D) Mound of bones

66. Which is the longest dam in India ?

(A) Bhakra-Nangal

(B) Rihand

(C) Hirakud

(D) Nagarjuna Sagar

67. The Thermal Power Plant in Tamil Nadu is

(A) Kundah (B) Ramagundam

(C) Pykara (D) Neyveli

68. Which one of the following regions does ***not*** come under the Mediterranean type of climate ?

(A) Iberian Peninsula

(B) California coast

(C) Chilean coast

(D) Eastern coast of South Africa

69. The main cause of faulting is

(A) Tension

(B) Wind

(C) Tidal activity

(D) Gravitational force

70. 'Pan American' refers to

(A) North America

(B) South America

(C) Central America

(D) All the above

71. Most primitive living vascular plants are

(A) Brown algae (B) Cycas

(C) Ferns (D) Sphagnum

72. Temporary wilting occurs in plants due to

(A) Respiration

(B) Transpiration

(C) Photosynthesis

(D) Absorption of water

73. Lichens are a symbiotic association of

(A) Algae and Fungi

(B) Bacteria and Fungi

(C) Bacteria and Algae

(D) Fungi and Higher plants

74. Photophobia is caused by the deficiency of

(A) Vitamin B_1 (B) Vitamin B_2

(C) Vitamin B_4 (D) Vitamin B_6

75. Which of the following is present only in plant cell ?

(A) Cell membrane

(B) Mitochondria

(C) Cell wall

(D) Endoplasmic reticulum

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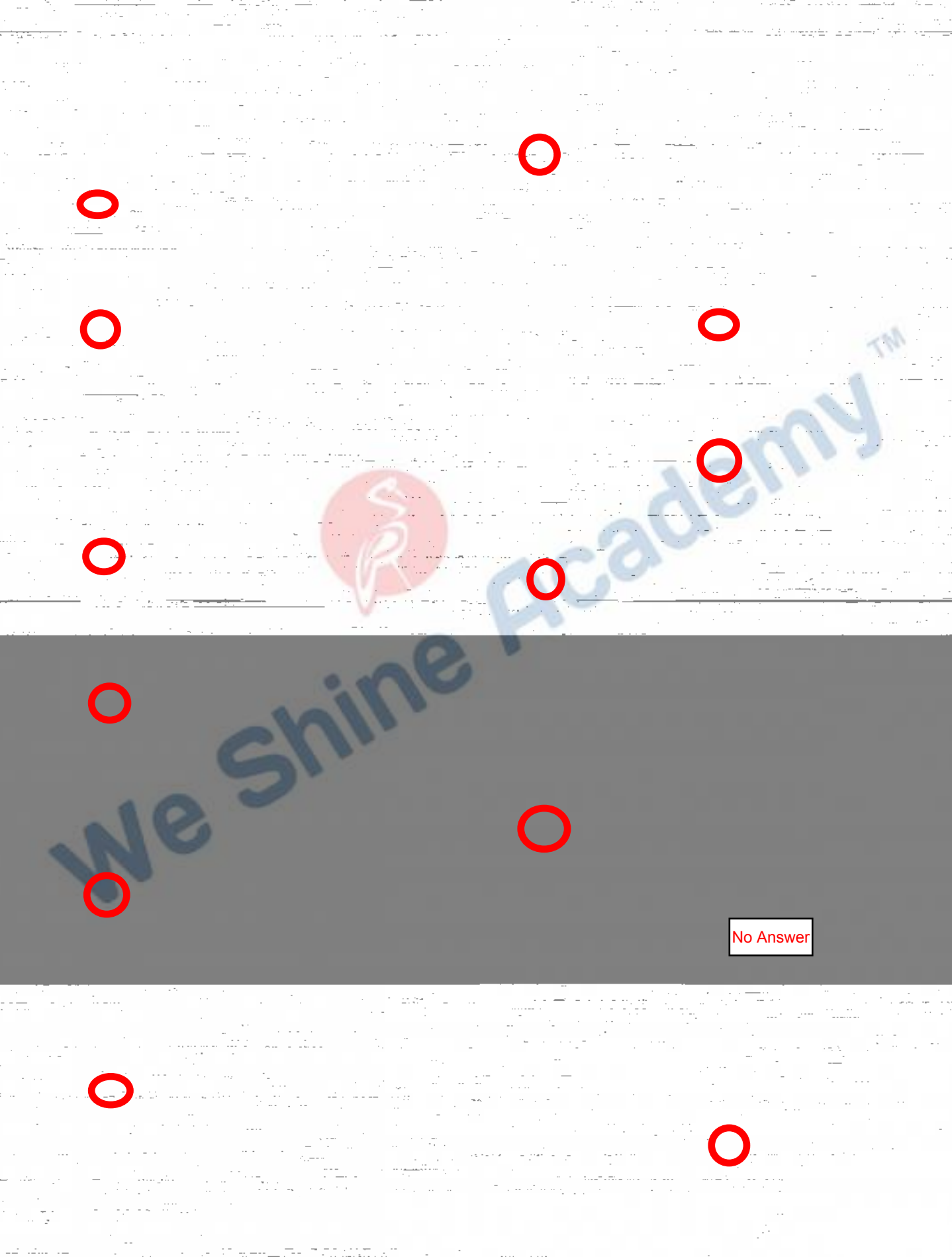
No Answer

89. A natural phenomenon that becomes harmful due to pollution is

(A) Global warming

(B) Ecological balance

(C) Greenhouse effect

(D) Desertification

90. Decomposers include

(A) Bacteria

(B) Fungi

(C) Both Bacteria and Fungi

(D) Animals

91. Who said about religion that "it is the opium of the masses" ?

(A) Hitler (B) Stalin

(C) Lenin (D) Marx

92. The first woman in the world to have climbed Mt. Everest twice is

(A) Bachendri Pal

(B) Molly Chacko

(C) Santosh Yadav

(D) Theresia Kiesl

93. What is the basic foundation of Gandhian thought ?

(A) Political campaigns

(B) Social movements

(C) Religion and morality

(D) Freedom of the individual

94. Amir Khusrau was a famous poet in the court of

(A) Akbar

(B) Shahjahan

(C) Ibrahim Lodhi

(D) Alauddin Khilji

95. In the year 1905, Gopal Krishna Gokhale founded the

(A) Servants of India Society

(B) Asiatic Society

(C) Brahmo Samaj

(D) Bharat Sewak Samaj

96. Gandhiji believed that Satyagraha is a weapon of

(A) the poor

(B) the weak

(C) the untouchables

(D) the brave

97. Pt. Shiv Kumar Sharma is an exponent of

(A) Mandolin

(B) Santoor

(C) Sitar

(D) Veena

98. Patanjali is well-known for the compilation of

(A) Yogasutra

(B) Panchatantra

(C) Brahmasutra

(D) Ayurveda

99. Which of the following Presidents of America abolished Slavery ?

(A) Abraham Lincoln

(B) Thomas Jefferson

(C) George Washington

(D) Stanley Jackson

100. Who is the first woman cosmonaut of the world ?

(A) Valentina Tereshkova

(B) Maria Estela Peron

(C) Svetlana Savitskaya

(D) Kay Cottee

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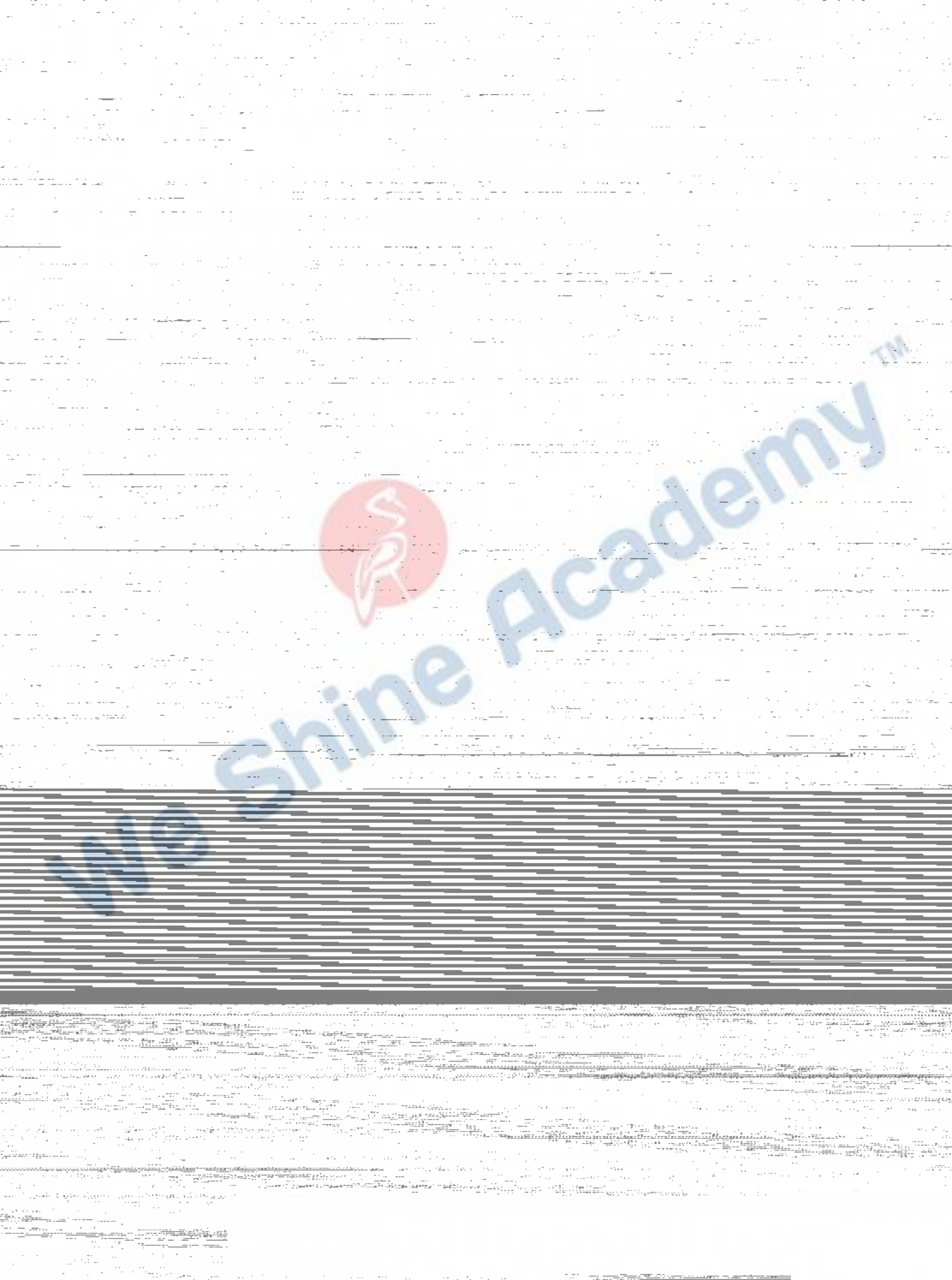

Shine Academy

145. The ratio of the quantity of water stored in the root zone of the crops to the quantity of water actually delivered in the field is known as

(A) water use efficiency

(B) water conveyance efficiency

(C) water application efficiency

(D) water storage efficiency

146. For unlined canals, the freeboard is measured from the

(A) full supply level to top of the bank

(B) top of the bank to bed of the canal

(C) full supply level to top of the dowel

(D) None of the above

147. The ruling minimum radius of the curve for ruling design speed V m/sec, coefficient of friction f, acceleration due to gravity g m/sec^2 and superelevation e is given by

(A) $V^2/(e-f)\,g$ (B) $V^2/(f-e)\,g$

(C) $V^2/(e+f)\,g$ (D) $V^2/(e+f)\,2g$

148. Camber in the road is provided for

(A) counteracting the centrifugal force

(B) effective drainage

(C) having proper sight distance

(D) avoiding overturning

149. The standard 5-day BOD at 20°C, when compared to ultimate BOD is about

(A) 60% (B) 68%

(C) 80% (D) 90%

150. The global warming is caused mainly by

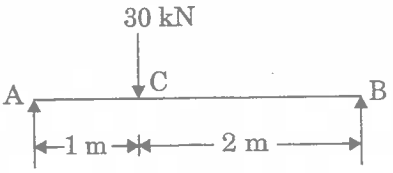
(A) NO_X (B) SO_X

(C) CO_2 (D) O_2

151. The maximum shear force in a simply supported beam of span L, subjected to a central point load, W is given by the following expression :

(A) $\frac{W}{2}$ (B) WL

(C) $WL^2/2$ (D) $WL^2/4$

152. 

For simply supported beam shown in Fig., the magnitude of vertical reaction at 'B' is

(A) 20 kN (B) 18 kN

(C) 15 kN (D) 10 kN

153. "Poisson's ratio" is defined as the ratio of

(A) lateral strain to linear strain

(B) linear strain to lateral strain

(C) lateral stress to linear stress

(D) linear stress to lateral stress

154. If 'A' is the area of cross-section and 'I' is the moment of inertia of a given plane section, then radius of gyration (r) is given by the formula

(A) $r = I/A$ (B) $r = \sqrt{I/A}$

(C) $r = A/I$ (D) $r = \sqrt{A/I}$

155. Strain energy due to axial deformation is given by

(σ : resultant stress
P : axial load
Δ : deformation
ε : strain
E : modulus of elasticity)

(A) $\sigma\varepsilon$ (B) $P\Delta$

(C) $\sigma^2/2E$ (D) $\frac{1}{2}P\Delta$

156. In a cantilever beam subjected to general loading, the maximum bending moment is at

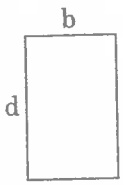
(A) fixed end

(B) free end

(C) mid-span

(D) quarter-span

157.



Moment of inertia of rectangular section shown in Fig. about its horizontal centroidal axis is

(A) $db^3/12$ (B) $db^3/3$

(C) $bd^3/12$ (D) $bd^3/3$

158. Ratio of length of column to the minimum radius of gyration of the cross-sectional area of the column is known as

(A) Slenderness ratio

(B) Buckling ratio

(C) Crippling ratio

(D) Compressive ratio

159. A linear force-deformation relation is obtained in materials

(A) having elastic stress-strain property

(B) having plastic stress-strain property

(C) following Hooke's law

(D) which are rigid elastic materials

160. The property of a material by which it can be beaten or rolled into plates, is called

(A) malleability

(B) ductility

(C) plasticity

(D) elasticity

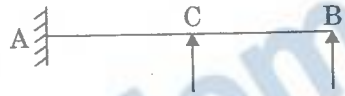
161. Which of the beams given in the following Figs. is a determinate beam ?

(A)

(B)

(C)

(D)



162. The effective slenderness ratio of a cantilever column is

(A) 0·5 L/r (B) L/r

(C) $\sqrt{2}$ L/r (D) 2 L/r

163. The top diameter, bottom diameter and the height of the steel mould used for slump test are

(A) 10 cm, 20 cm, 30 cm

(B) 10 cm, 30 cm, 20 cm

(C) 20 cm, 10 cm, 30 cm

(D) 20 cm, 30 cm, 10 cm

164. The early high strength of rapid hardening cement is due to its

(A) increased content of gypsum

(B) burning at high temperature

(C) increased content of cement

(D) higher content of tricalcium

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165. Di-calcium silicate (C_2S)

(A) hydrates rapidly

(B) generates less heat of hydration

(C) hardens rapidly

(D) has less resistance to sulphate attack

166. Separation of coarse aggregates from concrete during transportation, is known as

(A) bleeding (B) creeping

(C) segregation (D) evaporation

167. The resistance of an aggregate to wear is known as

(A) impact value

(B) abrasion resistance

(C) shear resistance

(D) crushing resistance

168. If fineness modulus of a sand is 2·5, it is graded as

(A) very fine sand

(B) fine sand

(C) medium sand

(D) coarse sand

169. Water-cement ratio is measured _____ of water and cement used per cubic metre of concrete.

(A) volume by volume

(B) weight by weight

(C) weight by volume

(D) volume by weight

170. To prevent segregation, the maximum height for placing concrete, is

(A) 100 cm (B) 125 cm

(C) 150 cm (D) 200 cm

171. An aggregate is said to be flaky, if its least dimension is less than

(A) $\frac{2}{3}$ mean dimension

(B) $\frac{1}{2}$ mean dimension

(C) $\frac{3}{5}$ mean dimension

(D) $\frac{3}{4}$ mean diameter

172. The fineness of cement can be found out by sieve analysis using IS sieve number

(A) 20 (B) 10

(C) 9 (D) 6

173. For batching 1 : 2 : 4 concrete mix by volume the ingredients required per bag (50 kg) of cement are

(A) 100 litres of fine aggregate : 140 litres of coarse aggregate

(B) 100 kg of fine aggregate : 200 kg of coarse aggregate

(C) 70 kg of fine aggregate : 140 kg of coarse aggregate

(D) 70 litres of fine aggregate : 140 litres of coarse aggregate

174. Bulking is

(A) increase in volume of sand due to moisture which keeps sand particles apart

(B) increase in density of sand due to impurities like clay, organic matter

(C) ramming of sand so that it occupies minimum volume

(D) compacting of sand

175. The concrete cubes are prepared, cured and tested according to Indian Standards code number

(A) IS : 515 (B) IS : 516

(C) IS : 517 (D) IS : 518

SPACE FOR ROUGH WORK / रफ़ कार्य के लिए स्थान

176. Workability of concrete for a given water content is good if the aggregates are

(A) angular aggregates

(B) flaky aggregates

(C) rounded aggregates

(D) irregular aggregates

177. Generally, strength of concrete is considered negligible/very low in

(A) Compression (B) Tension

(C) Fatigue (D) None of the above

178. As the cement sets and hardens, it generates heat. This is called

(A) Heat of hydration

(B) Latent heat

(C) Heat of vaporisation

(D) Sensible heat

179. In concrete, while hand mixing is adopted, excess cement to be added is

(A) 4% (B) 10%

(C) 14% (D) 20%

180. For constructing road pavements, the type of cement generally used is

(A) ordinary Portland cement

(B) rapid hardening cement

(C) low heat cement

(D) blast furnace slag cement

181. A very comfortable type of stair for usage is

(A) straight (B) dog legged

(C) open newel (D) circular

182. If the area of tension reinforcement provided is less than that required for a balanced section, then the RCC beam is called

(A) over reinforced

(B) neutral reinforced

(C) under reinforced

(D) bottom reinforced

183. In limit state of collapse for direct compression, the maximum axial compressive strain in concrete is

(A) 0·002 (B) 0·003

(C) 0·0035 (D) 0·004

184. A reduction factor C_r to load carrying capacity for a long column of effective length L_e and width b is applied as obtained from following expression :

(A) $1 - \frac{L_e}{24\,b}$ (B) $1{\cdot}25 - \frac{L_e}{36\,b}$

(C) $1{\cdot}25 - \frac{L_e}{48\,b}$ (D) $1{\cdot}5 - \frac{L_e}{60\,b}$

185. A T-beam behaves as a rectangular beam of a width equal to its flange if its neutral axis

(A) falls within the flange

(B) falls below the flange

(C) coincides with the geometrical centre of the beam

(D) falls below the centroidal axis of the beam

186. If τ_v is the nominal shear stress, τ_c is design shear strength of concrete and $\tau_{c,\,max}$ is the maximum design shear strength of concrete, which of the following statements is correct ?

(A) If $\tau_v > \tau_{c,\,max}$, section is to be designed for shear.

(B) If $\tau_v > \tau_{c,\,max}$, minimum shear reinforcement is to be provided.

(C) If $\tau_v < \tau_c$, minimum shear reinforcement is to be provided.

(D) If $\tau_v > \tau_c$, minimum shear reinforcement is to be provided.

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PART B : GENERAL ENGINEERING

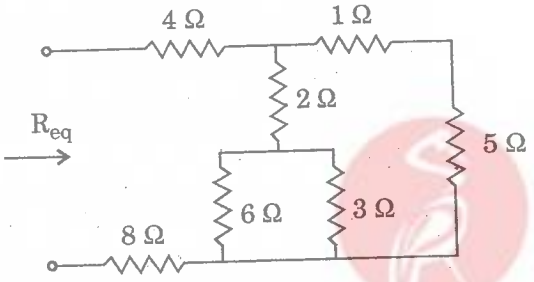
(ELECTRICAL)

101. A stove element draws 15 A when connected to 230 V line. How long does it take to consume one unit of energy ?

(A) 3·45 h (B) 2·16 h

(C) 1·0 h (D) 0·29 h

102. The R_{eq} for the circuit shown in figure is



(A) 14·4 Ω (B) 14·57 Ω

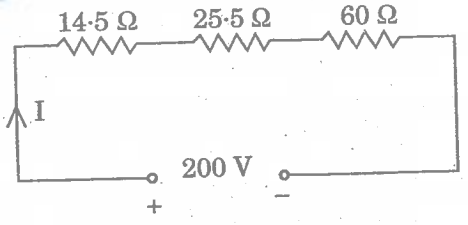
(C) 15·27 Ω (D) 15·88 Ω

103. The SI unit of conductivity is

(A) ohm-m (B) ohm/m

(C) mho-m (D) mho/m

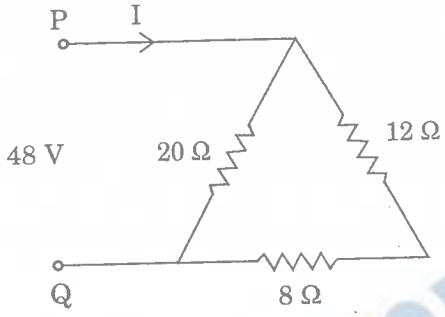
104. Calculate the voltage drop across 14·5 Ω resistance.



(A) 14·5 V (B) 18 V

(C) 29 V (D) 30·5 V

105. For the network shown in the figure, the value of current in 8 Ω resistor is



(A) 4·8 A (B) 2·4 A

(C) 1·5 A (D) 1·2 A

106. A piece of oil soaked paper has been inserted between the plates of a parallel plate capacitor. Then the potential difference between the plates will

(A) increase

(B) decrease

(C) remain unaltered

(D) become zero

107. The current drawn by a tungsten filament lamp is measured by an ammeter. The ammeter reading under steady state condition will be _____ the ammeter reading when the supply is switched on.

(A) same as (B) less than

(C) greater than (D) double

108. Tesla is same as

(A) Weber/meter

(B) Weber/(meter)^2

(C) Farad/meter

(D) Henry/(meter)^2

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146. If current through the operating coil of a moving iron instrument is doubled, the operating force becomes

(A) one and a half times

(B) 2 times

(C) 3 times

(D) 4 times

147. In moving iron instruments, the iron moves in a direction to cause

(A) coil inductance to be constant

(B) mutual inductance to be minimum

(C) minimum reluctance path

(D) decrease in the flux passing through it

148. A moving coil instrument has a resistance of 10 Ω and gives full scale deflection at 0·5 V potential difference across it. How can it be adapted to measure a current upto 100 A ?

(A) By connecting shunt resistance of 0·005 Ω across the meter

(B) By connecting shunt resistance of 0·05 Ω across the meter

(C) By connecting shunt resistance of 5 Ω across the meter

(D) By connecting shunt resistance of 10 Ω across the meter

149. The multiplying power of the shunt of a milliammeter is 8. If the circuit current is 200 mA, then current through the meter is

(A) 25 mA (B) 200 mA

(C) 1600 mA (D) 3200 mA

150. The material to be used in the manufacture of a standard resistor should be of

(A) low resistivity

(B) high resistivity and low temperature coefficient

(C) high temperature coefficient

(D) low resistivity and high temperature coefficient

151. In a 3-phase induction motor crawling happens at

(A) any speed

(B) no-load speed

(C) odd multiples of fundamental

(D) even multiples of fundamental

152. A 4-pole, 3-phase induction motor runs at 1440 rpm on a 50 Hz supply. Find the slip speed.

(A) 2940 rpm (B) 1500 rpm

(C) 1440 rpm (D) 60 rpm

153. Low voltage windings are placed nearer to the core in the case of concentric windings because

(A) it reduces hysteresis loss

(B) it reduces eddy current loss

(C) it reduces insulation requirement

(D) it reduces leakage fluxes

154. If K is the phase-to-phase voltage ratio, then the line-to-line voltage ratio in a 3-phase Y – Δ transformer is

(A) K (B) $K/\sqrt{3}$

(C) $\sqrt{3}\,K$ (D) $\sqrt{3}/K$

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155. In an autotransformer of voltage ratio $\frac{V_1}{V_2}$, $V_1 > V_2$, the fraction of power transferred inductively is proportional to

(A) $V_1 / (V_1 + V_2)$

(B) V_2 / V_1

(C) $(V_1 - V_2) / (V_1 + V_2)$

(D) $(V_1 - V_2) / V_1$

156. Stepped core is used in transformers in order to reduce

(A) volume of iron

(B) volume of copper

(C) iron loss

(D) reluctance of core

157. Commutation conditions at full load for large DC machines can be efficiently checked by the

(A) Brake test

(B) Swinburne's test

(C) Hopkinson's test

(D) Field test

158. The emf induced in a DC shunt generator is 230 V. The armature resistance is 0·1 Ω. If the armature current is 200 A, the terminal voltage will be

(A) 200 V (B) 210 V

(C) 230 V (D) 250 V

159. The commutator of a DC generator acts as

(A) an amplifier

(B) a rectifier

(C) a load

(D) a multiplier

160. Fleming's left hand rule is applicable to

(A) DC generator

(B) DC motor

(C) Alternator

(D) Transformer

161. Which of the following single phase motors is available with speed as low as one revolution per minute ?

(A) Shaded pole (B) Reluctance

(C) Hysteresis (D) Universal

162. A vacuum cleaner employs _____ motor.

(A) resistance split phase

(B) capacitor start

(C) shaded pole

(D) single phase series

163. In capacitor start single phase induction motor, the current in the

(A) supply lines leads the voltage

(B) starting winding lags the voltage

(C) main winding leads the voltage

(D) starting winding leads the voltage

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164. In a single phase induction motor, speed sensitive centrifugal switch is connected in _____ winding.

(A) parallel with main

(B) series with main

(C) parallel with starting

(D) series with starting

165. At starting, the current through the starting winding (I_s) of single phase induction motor

(A) lags 'V' by 90°

(B) leads 'V' by 90°

(C) is nearly in phase with 'V'

(D) leads 'V' by 75°

166. In a single phase induction motor at start, the two revolving fields produce

(A) unequal torques in the rotor conductors

(B) no torque in the rotor conductor

(C) equal and opposite torques in the rotor conductors

(D) equal torques in same direction in the rotor conductors

167. A synchronous motor can be used as synchronous condenser when it is

(A) over excited

(B) over loaded

(C) under excited

(D) under loaded

168. Which one of the following methods would give a higher than actual value of regulation of an alternator ?

(A) ZPF method (B) MMF method

(C) EMF method (D) ASA method

169. If the excitation of an alternator operating in parallel with other alternator is increased above the normal value of excitation, its

(A) power factor becomes more lagging

(B) power factor becomes more leading

(C) output current decreases

(D) output kW decreases

170. In an alternator, the effect of armature reaction is minimum at power factor of

(A) 0·5 lagging

(B) 0·866 lagging

(C) 0·866 leading

(D) unity

171. Damper winding in synchronous motors is used to

(A) suppress hunting

(B) improve power factor

(C) develop reluctance torque

(D) improve the efficiency

172. Turbo alternators have rotors of

(A) small diameter and long axial length

(B) large diameter and long axial length

(C) large diameter and small axial length

(D) small diameter and small axial length

173. Which of the following equipments is used to limit short-circuit current level in a sub-station ?

(A) Isolators

(B) Lightning switch

(C) Coupling capacitor

(D) Series reactor

SPACE FOR ROUGH WORK / रफ़ कार्य के लिए स्थान

174. Power distribution by cable is generally adopted for line length

(A) less than 10 km

(B) above 10 km

(C) less than 50 km

(D) above 50 km

175. The leakage resistance of a 50 km long cable is 1 MΩ. For a 100 km long cable it will be

(A) 0·5 MΩ (B) 2 MΩ

(C) 0·66 MΩ (D) None of these

176. If voltage is increased by 'n' times, the size of the conductor would

(A) increase by 'n' times

(B) reduce by '1/n' times

(C) increase by 'n^2' times

(D) reduce by '$1/n^2$' times

177. The maximum demand of a consumer is 2 kW and his daily energy consumption is 24 units. His load factor is _____ %.

(A) 24 (B) 41·6

(C) 50 (D) 80

178. A wire placed on the top of a transmission line acts as

(A) a phase wire

(B) neutral

(C) a transmission wire

(D) ground wire

179. The conductor, by means of which the metal body of an equipment or an application is connected to the earth, is known as

(A) Neutral continuity conductor

(B) Earth discontinuity conductor

(C) Earth continuity conductor

(D) Neutral discontinuity conductor

180. Which insulation is most widely used for covering wires/cables used in internal wiring ?

(A) Paper (B) Wood

(C) Glass (D) PVC

181. Which of the following types of wiring is preferred for workshop lighting ?

(A) Casing-Capping wiring

(B) Batten wiring

(C) Concealed conduit wiring

(D) Surface conduit wiring

182. The earthing electrodes should be placed within what distance in meters from the building whose installation system is being earthed ?

(A) 4 (B) 2·5

(C) 1·5 (D) 0·5

183. Supplier's fuse, which is provided in domestic wiring system is

(A) after the energy meter

(B) before the energy meter

(C) before distribution board

(D) after main switch

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184. As per recommendation of ISI, the maximum number of points of lights, fans and socket outlets that can be connected in one sub-circuit is

(A) 8 (B) 10

(C) 15 (D) 20

185. In a 3-pin plug

(A) all the three pins are of the same size

(B) two pins are of the same size but third one is thicker

(C) two pins are of the same size but third one is thicker and longer

(D) all the three pins are of different sizes

186. The acceptable value of grounding resistance to domestic application is

(A) 0·1 Ω (B) 1 Ω

(C) 10 Ω (D) 100 Ω

187. Inside the earth pit, the earthing electrode should be placed

(A) vertical

(B) horizontal

(C) inclined at 45°

(D) inclined at any angle other than 45°

188. To reduce the cost of the electricity generated

(A) the load factor and diversity factor must be low

(B) the load factor must be low but diversity factor high

(C) the load factor must be high but diversity factor low

(D) the load factor and diversity factor must be high

189. The colour of the light given out by a sodium vapour discharge lamp is

(A) pink (B) bluish green

(C) yellow (D) blue

190. The transformer used in a welding set is

(A) step-up transformer

(B) step-down transformer

(C) constant current transformer

(D) booster transformer

191. The domestic load that has UPF is

(A) Fan

(B) Mixer

(C) Tube

(D) Filament lamp

192. An industrial consumer has a daily load pattern of 2000 kW, 0·8 lag for 12 hours and 1000 kW UPF for 12 hours. The load factor is

(A) 0·5 (B) 0·75

(C) 0·6 (D) 2·0

193. Dielectric loss is proportional to

(A) $[\text{frequency}]^{1/2}$ (B) frequency

(C) frequency^2 (D) frequency^3

194. Which of the following applications needs frequent starting and stopping of electric motor ?

(A) Air-conditioner

(B) Lifts and hoists

(C) Grinding mill

(D) Paper mill

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Machine Academy™

110. What type of contact occurs during meshing of helical gears ?

(A) Point (B) Line

(C) Area (D) Volume

111. Which one of the following drives is used for transmitting power without slip ?

(A) Belt drives

(B) Rope drives

(C) Cone pulleys

(D) Chain drives

112. The contact between cam and follower is to form a

(A) lower pair

(B) higher pair

(C) sliding pair

(D) rolling pair

113. Which of the following is antifriction bearing ?

(A) Needle bearing

(B) Pedestal bearing

(C) Collar bearing

(D) Hydrostatic bearing

114. Helical gears have their teeth

(A) inclined to wheel rim

(B) straight over the wheel rim

(C) curved over the wheel rim

(D) cut on the surfaces of the frusta of cones

115. When the speed of governor increases, then

(A) height of governor and radius of rotation increase

(B) height of governor and radius of rotation decrease

(C) height of governor decreases but radius of rotation increases

(D) height of governor increases but radius of rotation decreases

116. A body of weight 30 N rests on a horizontal floor. A gradually increasing horizontal force is applied to the body which just starts moving when the force is 9 N. The coefficient of friction between the body and the floor will be

(A) 10/3 (B) 3/10

(C) 1/3 (D) 1/9

117. A body of weight W is placed on a rough inclined plane. The inclination of the plane with the horizontal is less than the angle of friction. The body will

(A) be in equilibrium

(B) move downwards

(C) move upwards

(D) None of the above

118. A ball is dropped vertically downwards, it hits the floor with a velocity of 9 m/s and bounces to a distance of 1·2 m. Coefficient of restitution between the floor and the ball is

(A) 0·54 (B) zero

(C) 1 (D) 0·27

119. For a material with Poisson's ratio 0·25, the ratio of modulus of rigidity to modulus of elasticity will be

(A) 0·4 (B) 1·2

(C) 2·0 (D) 3·6

120. If equal and opposite forces applied to a body tend to elongate it, then the stress produced is

(A) tensile stress

(B) bending stress

(C) compressive stress

(D) shear stress

SPACE FOR ROUGH WORK / रफ़ कार्य के लिए स्थान

150. In an isothermal process, the internal energy

(A) always increases

(B) always decreases

(C) increases or decreases

(D) remains constant

151. Which of the following is a boiler mounting ?

(A) Safety valve

(B) Economizer

(C) Superheater

(D) Feed pump

152. Which part of a petrol engine would need modifications if the engine is to be made to run on LPG ?

(A) Piston (B) Crank shaft

(C) Valves (D) Carburettor

153. An adiabatic process in a thermodynamic system is one in which there is

(A) a limited heat transfer to or from the system through the boundary

(B) no heat transfer to or from the system through the boundary

(C) no energy transfer to or from the system through the boundary

(D) no internal energy change in the system

154. A device used to increase the temperature of saturated steam without raising its pressure is called

(A) fusible plug (B) blow-off cock

(C) economiser (D) superheater

155. Maximum diagram efficiency for Parson's reaction turbine is given by

(A) $2\cos^2\alpha/(1+\cos\alpha)$

(B) $\cos^2\alpha/(1+2\cos\alpha)$

(C) $\cos^2\alpha/(1+2\cos^2\alpha)$

(D) $2\cos^2\alpha/(1+2\cos^2\alpha)$

156. The delay period in a petrol engine is of the order of

(A) 0·001 sec (B) 0·002 sec

(C) 0·01 sec (D) 0·05 sec

157. Octane number of iso-octane is

(A) 50 (B) 70

(C) 0 (D) 100

158. The silencer of an IC engine

(A) reduces noise

(B) decreases brake specific fuel consumption

(C) increases brake specific fuel consumption

(D) has no effect on efficiency

159. The compression ratio for a practical diesel engine usually lies in the range

(A) 5 – 7 (B) 7 – 9

(C) 10 – 15 (D) 16 – 22

160. For a four-cylinder engine, the firing order for evenness of torque is

(A) 1 – 2 – 3 – 4 (B) 1 – 3 – 2 – 4

(C) 1 – 4 – 3 – 2 (D) 1 – 3 – 4 – 2

161. The drag coefficient is defined as

(A) $(F_D/A)/(\rho v_0^2)$

(B) $(F_D/A)/(2\rho v_0^2)$

(C) $F_D/(0{\cdot}5\rho v_0^2)$

(D) $F_D/(0{\cdot}5\rho v_0^2 A)$

162. The length of the divergent portion of venturimeter in comparison to convergent portion is

(A) same

(B) more

(C) less

(D) depending upon the type of flow

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163. Froude's Number relates to

(A) inertia force and gravity force

(B) inertia force and pressure force

(C) inertia force and surface tension force

(D) inertia force and elastic force

164. In pitot-tube the velocity of flow at a point is reduced to zero. That point is called as

(A) stagnation point

(B) critical point

(C) metacentre

(D) equilibrium point

165. The velocity distribution in a pipe flow is parabolic if the flow is

(A) uniform, turbulent

(B) uniform, laminar

(C) non-uniform, steady

(D) rotational, compressible

166. Mercury does ***not*** wet the glass surface. This property of mercury is due to

(A) adhesion (B) cohesion

(C) surface tension (D) viscosity

167. Loss of head due to friction in a uniform diameter pipe with viscous flow is

(A) Re (B) 1/Re

(C) 4/Re (D) 16/Re

168. Maximum theoretical efficiency of Pelton wheel is obtained when the ratio of bucket speed to jet speed is

(A) 0·26 (B) 0·98

(C) 0·46 (D) 0·58

169. The velocity distribution for flow over a flat plate is given by $u = (y - y^2)$ in which u is velocity in metres per second at a distance y metres above the plate. What is the shear stress value at y = 0·15 m ? The dynamic viscosity of fluid is 8·0 poise.

(A) 12·4 N/m^2 (B) 1·24 N/m^2

(C) 0·56 N/m^2 (D) 5·6 N/m^2

170. A hydraulic turbine runs at 240 rpm under a head of 9 m. What will be the speed (in rpm) of the turbine if operating head is 16 m ?

(A) 320 (B) 426

(C) 264 (D) 230

171. The discharge of a liquid of kinematic viscosity 4×10^{-2} m^2/s through a 80 mm diameter pipe is $3200\pi \times 10^{-4}$ m^3/s. The flow is

(A) laminar (B) turbulent

(C) transition (D) critical

172. The velocity at a point on the crest of a model dam was measured to be 1 m/s. The corresponding prototype velocity for a linear scale ratio of 25, in m/s, is

(A) 25 (B) 2·5

(C) 5 (D) 0·04

173. Pressure force on the 15 cm diameter headlight of an automobile travelling at 0·25 m/s is

(A) 10·4 N (B) 6·8 N

(C) 4·8 N (D) 3·2 N

174. A piece of metal of specific gravity 7 floats in mercury of specific gravity 13·6. What fraction of its volume is under mercury ?

(A) 0·5 (B) 0·4

(C) 0·515 (D) 0·415

175. The friction head lost due to flow of a viscous fluid through a circular pipe of length L and diameter d with a velocity v and pipe Fanning friction factor f is

(A) $\frac{4\,fL}{d} \cdot \frac{v^2}{2g}$ (B) $\frac{4\,fL}{\pi d^2} \cdot \frac{v^2}{2g}$

(C) $\frac{v^2}{2g}$ (D) $\frac{4\,fL}{\pi d} \cdot \frac{v^2}{2g}$

176. The ratio of pressures between two points A and B located respectively at depths 0·5 m and 2 m below a constant level of water in a tank is

(A) 1 : 1 (B) 1 : 2

(C) 1 : 4 (D) 1 : 16

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177. Using Blasius equation, the friction factor for turbulent flow through pipes varies as

(A) Re^{-1} (B) $Re^{-0.5}$

(C) $Re^{-0.33}$ (D) $Re^{-0.25}$

178. The specific speed (N_S) of a centrifugal pump is given by

(A) $\frac{N\sqrt{Q}}{H^{2/3}}$ (B) $\frac{N\sqrt{Q}}{H^{3/4}}$

(C) $\frac{N\sqrt{Q}}{H}$ (D) $\frac{N\sqrt{Q}}{H^{5/4}}$

179. Pressure intensity inside the water droplets is (where σ – surface tension

d – diameter of bubble)

(A) $p = \frac{8\sigma}{d}$ (B) $p = \frac{2\sigma}{d}$

(C) $p = \frac{4\sigma}{d}$ (D) $p = \frac{\sigma}{d}$

180. The length of a rectangular weir is L and height H_1. The maximum depth of water on the upstream side of the weir is H. Flow rate over the notch (Q) is

(A) $Q = \frac{2}{3} c_d L\sqrt{2g}\ H^{5/2}$

(B) $Q = \frac{2}{3} c_d L\sqrt{2g}\ (H - H_1)^{5/2}$

(C) $Q = \frac{2}{3} c_d L\sqrt{2g}\ H^{3/2}$

(D) $Q = \frac{2}{3} c_d L\sqrt{2g}\ (H - H_1)^{3/2}$

181. The coefficient of discharge (c_d) of an orifice varies with

(A) Weber number

(B) Mach number

(C) Reynold's number

(D) Froude number

182. A hydrometer is used to determine

(A) relative humidity

(B) surface tension of liquids

(C) specific gravity of liquids

(D) viscosity of liquids

183. In flow through a pipe, the transition from laminar to turbulent flow does ***not*** depend on

(A) velocity of the fluid

(B) density of the fluid

(C) length of the pipe

(D) diameter of the pipe

184. Low specific speed of a turbine implies that it is

(A) Propeller turbine

(B) Francis turbine

(C) Impulse turbine

(D) Kaplan turbine

185. Flow of water in a pipe about 3 metres in diameter can be measured by

(A) Orifice plate (B) Venturi

(C) Pitot tube (D) Nozzle

186. In a pitot tube, at the stagnation point.

(A) pressure is zero

(B) total energy is zero

(C) pressure head is equal to velocity

(D) all the velocity head is converted into pressure head

187. Navier – Stokes equations are associated with

(A) Buoyancy

(B) Supersonic flow

(C) Vortex flow

(D) Viscous flow

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