सहायक मोटार वाहन निरीक्षक (मुख्य) स्पर्धा परीक्षा - 2017

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दि. 6 ऑगस्ट, 2017

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प्रश्नपुस्तिका क्रमांक

प्रश्नपुस्तिका BOOKLET NO.

यंत्र अभियांत्रिकी स्वयंचल अभियांत्रिकी/
यंत्र अभियांत्रिकी/स्वयंचल अभियांत्रिकी

वेळ : $1\frac{1}{2}$ (दीड) तास

एकूण प्रश्न : 150

एकूण गुण : 300

सूचना

(1) उमेदवारांनी एकूण 150 प्रश्न सोडवावयाचे आहेत. उमेदवारांनी प्रश्नांची उत्तरे लिहिण्यास सुरुवात करण्यापूर्वी या प्रश्नपुस्तिकेत सर्व प्रश्न आहेत किंवा नाहीत याची खात्री करून घ्यावी. असा तसेच अन्य काही दोष आढळल्यास ही प्रश्नपुस्तिका समवेक्षकांकडून लगेच बदलून घ्यावी.

परीक्षा-क्रमांक

केंद्राची संकेताक्षरे — शेवटचा अंक

(2) आपला परीक्षा-क्रमांक ह्या चौकोनांत **न विसरता बॉल्पेनने** लिहावा.

(3) वर छापलेला प्रश्नपुस्तिका क्रमांक तुमच्या उत्तरपत्रिकेवर विशिष्ट जागी उत्तरपत्रिकेवरील सूचनेप्रमाणे **न विसरता नमूद करावा.**

(4) या प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाला 4 पर्यायी उत्तरे सुचविली असून त्यांना 1, 2, 3 आणि 4 असे क्रमांक दिलेले आहेत. त्या चार उत्तरांपैकी सर्वात योग्य उत्तराचा क्रमांक उत्तरपत्रिकेवरील सूचनेप्रमाणे तुमच्या उत्तरपत्रिकेवर नमूद करावा. अशा प्रकारे उत्तरपत्रिकेवर उत्तरक्रमांक नमूद करताना तो संबंधित प्रश्नक्रमांकासमोर छायांकित करून दर्शविला जाईल याची काळजी घ्यावी. **ह्याकरिता फक्त काळ्या शाईचे बॉल्पेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.**

(5) सर्व प्रश्नांना समान गुण आहेत. यास्तव सर्व प्रश्नांची उत्तरे द्यावीत. घाईमुळे चुका होणार नाहीत याची दक्षता घेऊनच शक्य तितक्या वेगाने प्रश्न सोडवावेत. क्रमाने प्रश्न सोडविणे श्रेयस्कर आहे पण **एखादा प्रश्न कठीण वाटल्यास त्यावर वेळ न घालविता पुढील प्रश्नाकडे वळावे.** अशा प्रकारे शेवटच्या प्रश्नापर्यंत पोहोचल्यानंतर वेळ शिल्लक राहिल्यास कठीण म्हणून वगळलेल्या प्रश्नांकडे परतणे सोईस्कर ठरेल.

(6) उत्तरपत्रिकेत एकदा नमूद केलेले उत्तर खोडता येणार नाही. नमूद केलेले उत्तर खोडून नव्याने उत्तर दिल्यास ते तपासले जाणार नाही.

(7) **प्रस्तुत परीक्षेच्या उत्तरपत्रिकांचे मूल्यांकन करताना उमेदवाराच्या उत्तरपत्रिकेतील योग्य उत्तरांनाच गुण दिले जातील. तसेच ''उमेदवाराने वस्तुनिष्ठ बहुपर्यायी स्वरूपाच्या प्रश्नांची अचूक उत्तरेच उत्तरपत्रिकेत नमूद करावीत. अन्यथा त्यांच्या उत्तरपत्रिकेत सोडविलेल्या प्रत्येक चार चुकीच्या उत्तरांसाठी एका प्रश्नाचे गुण वजा करण्यात येतील''.**

: विशेष सूचना :

सदर प्रश्नपत्रिका विभाग - 'अ', 'ब' आणि 'क' विभागांमध्ये विभागण्यात आली आहे. त्यापैकी 'विभाग - अ - Mechanical Engineering-Automobile Engineering' मधील प्रश्न (प्र.क्र. 1-120) हे अनिवार्य आहेत. तर 'विभाग - ब - Mechanical Engineering' (प्र.क्र. 121-150) किंवा 'विभाग - क - Automobile Engineering' (प्र.क्र. 151-180) यापैकी एकाच विभागातील प्रश्न सोडविणे बंधनकारक आहे. याची कृपया उमेदवारांनी नोंद घ्यावी.

ताकीद

ह्या प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपेपर्यंत ही प्रश्नपुस्तिका आयोगाची मालमत्ता असून ती परीक्षाकक्षात उमेदवारास परीक्षेसाठी वापरण्यास देण्यात येत आहे. ही वेळ संपेपर्यंत सदर प्रश्नपुस्तिकेची प्रत/प्रती, किंवा सदर प्रश्नपुस्तिकेतील काही आशय कोणत्याही स्वरूपात प्रत्यक्ष वा अप्रत्यक्षपणे कोणत्याही व्यक्तीस पुरविणे, तसेच प्रसिद्ध करणे हा गुन्हा असून अशी कृती करणाऱ्या व्यक्तीवर शासनाने जारी केलेल्या ''परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचा अधिनियम-82'' यातील तरतुदीनुसार तसेच प्रचलित कायद्याच्या तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.

तसेच ह्या प्रश्नपत्रिकेसाठी विहित केलेली वेळ संपण्याआधी ही प्रश्नपुस्तिका अनधिकृतपणे बाळगणे हा सुद्धा गुन्हा असून तसे करणारी व्यक्ती आयोगाच्या कर्मचारीवृंदापैकी, तसेच परीक्षेच्या पर्यवेक्षकीयवृंदापैकी असली तरीही अशा व्यक्तीविरूद्ध उक्त अधिनियमानुसार कारवाई करण्यात येईल व दोषी व्यक्ती शिक्षेस पात्र होईल.

पुढील सूचना प्रश्नपुस्तिकेच्या अंतिम पृष्ठावर पहा

पर्यवेक्षकांच्या सूचनेविना हे सील उघडू नये

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

विभाग - 'अ'

1. The neutral axis of the cross-section of a beam is that axis at which the bending stress is :
(1) zero (2) minimum (3) maximum (4) infinite

2. Moment of inertia of quarter circle of radius 'r' about 'x' axis passing through centroid is :
(1) $I_X = 0.055\ r^4$ (2) $I_X = 0.11\ r^4$ (3) $I_X = 0.4\ r^4$ (4) None of these

3. Thin cylindrical shell of length 'L' diameter 'd' and thickness 't', subjected to internal pressure P. What is the change in length if it is made up of material having modulus of elasticity E and poisson's ratio 'μ' ?

(1) $\delta L = \frac{PdL}{2tE}\left(\frac{1}{2} - \mu\right)$ (2) $\delta L = \frac{PdL}{2tE}(1 - \mu)$

(3) $\delta L = \frac{PdL}{2tE}(1 - 2\mu)$ (4) None of these

4. Angle between major principal plane and minor principal plane for strained body is :
(1) 45° (2) 30° (3) 60° (4) 90°

5. A steel plate is bent into a circular arc of radius 10 meters. If the plate section be 120 mm wide and 20 mm thick, the maximum stress induced will be :
(Take $E = 2 \times 10^5\ N/mm^2$)
(1) $400\ N/mm^2$ (2) $200\ N/mm^2$
(3) $100\ N/mm^2$ (4) $150\ N/mm^2$

6. The ratio of critical load of columns of same dimensions and same material. One is fixed at both ends and other is fixed at one end and hinged at other end :
(1) $\sqrt{2}$ (2) 2 (3) 0.5 (4) 4

7. Moment of inertia of hollow rectangular section having outer depth 'D' and breadth 'B' and dimensions of inner rectangle are depth 'd' and width 'b' about horizontal axis passing through centroid is :

(1) $\frac{BD^3}{12}$ (2) $\frac{bd^3}{12}$ (3) $\frac{BD^3 - bd^3}{12}$ (4) $\frac{BD^2 - bd^2}{12}$

8. The ratio of the largest load in a test to the original cross-sectional area of the test piece is :
(1) elastic unit (2) yield stress (3) ultimate stress (4) breaking stress

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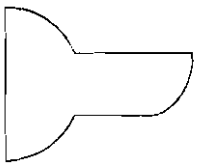
9. The shear force diagram for a simply supported beam carrying a uniformly distributed load of ω per unit length, consists of :
   (1) one right angled triangle (2) two right angled triangles
   (3) one equilateral triangle (4) two equilateral triangles

10. The stress at which the extension of the material takes place considerably as compared to the increase in load, is called :
   (1) elastic limit (2) yield point (3) ultimate point (4) breaking point

11. The shear stress distribution over a beam cross-section is shown in figure. The beam is of :



   (1) equal flange I-section
   (2) unequal flange I-section
   (3) circular cross-section
   (4) T - section

12. The relation between Young's modulus (E), shear modulus (G) & bulk modulus (K) is given by :
   (1) $E = \frac{3KG}{3K+G}$ (2) $E = \frac{6KG}{3K+G}$ (3) $E = \frac{9KG}{3K+G}$ (4) $E = \frac{12KG}{3K+G}$

13. What is the shape of shearing stress distribution across a rectangular cross-section beam ?
   (1) Triangular
   (2) Parabolic only
   (3) Rectangular only
   (4) A combination of rectangular and parabolic shape

14. A beam has triangular cross-section having base b & altitude h. If the section of beam is subjected to a shear force F, the shear stress at the level of neutral axis in the cross-section is given by :
   (1) $\frac{4F}{3bh}$ (2) $\frac{3F}{4bh}$ (3) $\frac{8F}{3bh}$ (4) $\frac{3F}{8bh}$

15. What is the ratio of maximum shear stress to average shear stress in a beam of circular section ?
   (1) 1.5 (2) 2 (3) 1.33 (4) 2.5

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16. Defect such as slight eccentricity, a wavy surface, or a slight taper caused by previous operations can be corrected by :
(1) Grinding operation (2) Lapping operation
(3) Honing operation (4) Turning operation

17. Chipping of tool may occur due to :
(a) tool material is too brittle
(b) As a result of crack that is already in the tool
(c) Excessive static loading of the tool
(d) Weak design of tool, such as high positive rake angle
Answer Options :
(1) Only (a) and (b) (2) Only (b) and (c)
(3) Only (a) and (c) (4) All (a), (b), (c) and (d)

18. 'Microstoning' is the following type of operation :
(1) Roughing (2) Finishing
(3) Super-finishing (4) Polishing

19. In orthogonal cutting system the cutting edge is :
(1) In line with direction of tool travel
(2) Perpendicular to direction of tool travel
(3) Perpendicular to shear plane
(4) Perpendicular to direction of depth of cut

20. Colour code for part to be machined for wooden patterns is represented by following colour :
(1) Red or orange (2) Yellow
(3) Black on core prints (4) Green

21. The extrusion process used in manufacturing short length components like tooth paste tubes, gun shells etc. is :
(1) Indirect extrusion (2) Direct extrusion
(3) Hydrostatic extrusion (4) Continuous extrusion

22. 'Qualified tooling' and 'preset tooling', these two basic types of tooling are used in :
(1) Conventional lathe machines
(2) Conventional milling machines
(3) Unconventional machining centres
(4) NC turning machines

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23. As per Hume-Rothery rules of solid solubility, the difference between atomic sizes of solute and solvent should be less than :
(1) 20% (2) 25% (3) 15% (4) 28%

24. The broaching operation in which the work moves past the stationary tool is called :
(1) Pull broaching (2) Push broaching
(3) Surface broaching (4) Continuous broaching

25. In down or climb milling :
(a) direction of rotation of cutter is opposite to work feed direction
(b) direction of rotation of cutter coincides with the direction of work feed
(c) chip thickness is minimum (zero) at the start and maximum at the end of cut
(d) chip thickness is maximum at the start and minimum (zero) at the end of cut
Answer Options :
(1) (a) and (c) only (2) (b) and (c) only
(3) (a) and (d) only (4) (b) and (d) only

26. Laser beam machining process is used for machining :
(1) Very thick materials (2) Thin materials
(3) Heavy Sections (4) There is no such limitations

27. In the broaching operation :
(1) Production capacity is high because cutting speed is high
(2) Production capacity is low because cutting speed is low
(3) Production capacity is high though cutting speed is low
(4) None of the above

28. Back gears are used in centre lathe for :
(a) effective reduction in spindle speed
(b) increase in spindle speeds
(c) facilitating wider range of speeds
(d) spare purpose
Answer Options :
(1) (a) and (b) (2) (a) and (c) (3) (b) and (c) (4) (a) and (d)

29. The abrasives used in super finishing is a :
(1) Coated abrasive (2) Bonded abrasive
(3) Both (1) and (2) (4) None of the above

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

30. The chip thickness ratio 'r' in orthogonal metal cutting operation is always :
(1) Greater than unity (2) Less than unity
(3) Equal to unity (4) Equal to depth of cut

31. A machine tool having a dedicated computer to help prepare the program and control some or all of the operations of the machine tool is called :
(1) Numerical Control Machine Tool
(2) Computer Numerical Control Machine Tool
(3) Direct Numerical Control Machine Tool
(4) None of the above

32. In drawing process tractix curve is a special profile in which radius of curvature :
(1) Continuously increases (2) Continuously decreases
(3) Remains same (4) None of the above

33. Which of the following is chip removal process ?
(1) Rolling (2) Extruding (3) Die casting (4) Broaching

34. The process of chamfering the entrance of a drilled hole is known as :
(1) Counter boring (2) Counter sinking
(3) Counter fillet (4) Trepanning

35. For thread cutting and drilling cycles following codes are used :
(1) G - 33 and G - 83 respectively (2) G - 83 and G - 33 respectively
(3) G - 81 and G - 83 respectively (4) G - 33 and G - 81 respectively

36. The effort of a governor is defined as the force required to be applied for what percentage change of speed ?
(1) 1 percent (2) 5 percent (3) 10 percent (4) any percent

37. The direction of Corioili's component of acceleration is obtained by :
(1) Rotating V (Velocity of slider w.r.t. coincident point) at 180 degree about its origin in the same direction as that of ω (angular velocity of slotted lever)
(2) Rotating V (Velocity of slider w.r.t. coincident point) at 90 degree about its origin in the same direction as that of ω (angular velocity of slotted lever)
(3) Rotating V (Velocity of slider w.r.t. coincident point) at 90 degree about its origin in the opposite direction as that of ω (angular velocity of slotted lever)
(4) Rotating V (Velocity of slider w.r.t. coincident point) at 270 degree about its origin in the same direction as that of ω (angular velocity of slotted lever)

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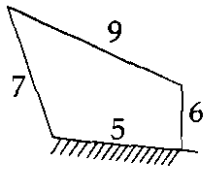
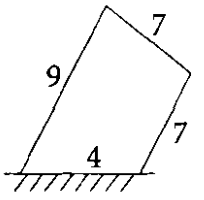
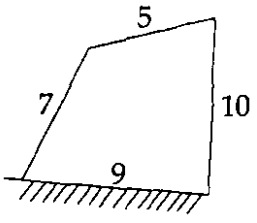
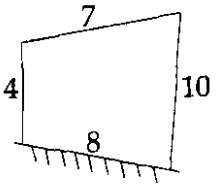
38. In the figures given below, the number indicates length of the link.
Which one of the following mechanisms is crank-rocker mechanism ?

(1) 

(2) 

(3) 

(4) 

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39. Match **List I** and **II** and select correct answer from the options given :

	List - I		**List - II**
(a)	Hunting	(i)	One radius of rotation for each speed
(b)	Isochronism	(ii)	Too sensitive
(c)	Stability	(iii)	Mean force exerted at sleeve during change of speed
(d)	Effort	(iv)	Constant equilibrium speed for all radii of rotation

Answer Options :

	(a)	**(b)**	**(c)**	**(d)**
(1)	(ii)	(iv)	(i)	(iii)
(2)	(iii)	(i)	(iv)	(ii)
(3)	(ii)	(i)	(iv)	(iii)
(4)	(i)	(ii)	(iii)	(iv)

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40. Pendulum pump is an inversion of :

(1) Four bar chain (2) Single slider crank chain
(3) Double slider crank chain (4) None of the above

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41. In automobiles, Hooke's joint is used between which of the following ?

(1) Clutch and gear box (2) Gear box and differential
(3) Differential and wheels (4) Fly wheel and clutch

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42. The product of circular pitch and diametral pitch is equal to :

(1) $P_c \cdot P_d = \pi$ (2) $P_c \cdot P_d = 2\pi$

(3) $P_c \cdot P_d = \frac{\pi}{2}$ (4) $P_c \cdot P_d = 1$

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43. In a pantograph, all the pairs are :

(1) Turning pairs (2) Sliding pairs

(3) Spherical pairs (4) Screw pairs

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44. In a kinematic chain, a quarternary joint is equivalent to :

(1) one binary joint (2) two binary joints

(3) three binary joints (4) four binary joints

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45. The frictional torque transmitted in a conical pivot bearing, considering uniform wear is :

(1) $\frac{1}{2} \cdot \mu \cdot W \cdot r \cdot \text{cosec } \alpha$ (2) $\frac{2}{3} \cdot \mu \cdot W \cdot r \cdot \text{cosec } \alpha$

(3) $\frac{3}{4} \cdot \mu \cdot W \cdot r \cdot \text{cosec } \alpha$ (4) $\mu \cdot W \cdot r \cdot \text{cosec } \alpha$

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46. The condition for correct steering for a Davis steering gear, where

α = Angle of inclination of the links to the vertical

b = Wheel base

c = Distance between the pivots of the front axle is :

(1) $\sin\alpha = b/c$ (2) $\cos\alpha = c/b$

(3) $\tan\alpha = c/2b$ (4) $\cot\alpha = c/2b$

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47. For a follower moving with cycloidal motion, the velocity of the follower is maximum at the :

(1) Beginning of the outstroke (2) End of the outstroke

(3) Middle of the outstroke (4) None of the above

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48. The planes of spin, precession and applied gyroscopic couple are :

(1) the same one plane

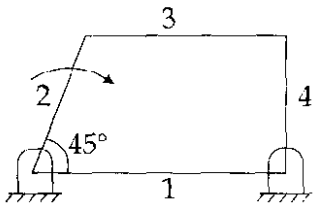
(2) two planes perpendicular to one another

(3) three planes perpendicular to one another

(4) none of the above

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

49. The magnitude of absolute angular velocity of link 2 is 10 rad/s while that of link 3 is 6 rad/s, what is the angular velocity of link 3 relative to 2 ?



(1) 6 rad/s (2) 16 rad/s (3) 4 rad/s (4) 14 rad/s

---

50. In a gear train where the axes of gears have motion are called :
(1) Reverted gear trains (2) Epicyclic gear trains
(3) Compound gear trains (4) Bevel wheel gear trains

---

51. With increase of governor speed :
(1) radius of rotation and height of governor increases
(2) radius of rotation and height of governor decreases
(3) radius of rotation decreases but height of governor increases
(4) radius of rotation increases but height of governor decreases

---

52. The instantaneous centre of a slider moving on a curved surface lies at :
(1) infinity
(2) their point of contact
(3) the centre of curvature of curved surface
(4) the pin point

---

53. Axial thrust has significant effect in case of which of the following gear ?
(1) Spur gear (2) Helical gear
(3) Double helical gear (4) Herringbone gear

---

54. The ratio of frictional torque produced for uniform wear to that for uniform pressure is :
(1) 1 (2) 2/3 (3) 4/3 (4) 3/4

---

55. The following profiles of gears satisfy the law of gearing :
(1) conjugate profiles of mating teeth
(2) involute profiles of mating teeth
(3) cycloidal profiles of mating teeth
(4) all of the above

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

56. Boundry Layer Thickness (δ) is the distance from the surface of the solid body in the direction perpendicular to flow, where the velocity of fluid is equal to :

(1) Free stream velocity (2) 1.2 times the free stream velocity
(3) 0.99 times the free stream velocity (4) None of the above

57. Bernoulli's equation is applicable to :

(1) Steady Flow (2) Unsteady Flow
(3) Both steady and unsteady Flow (4) None of above

58. For laminar flow through a round pipe, which statement is **correct** ?

(1) High velocity and high density fluid.
(2) High velocity and high viscosity fluid.
(3) Low velocity and high viscosity fluid.
(4) Low density and low viscosity fluid.

59. Reynold's number is defined as the :

(1) ratio of inertia force to gravity force (2) ratio of viscous force to gravity force
(3) ratio of viscous force to elastic force (4) ratio of inertia force to viscous force

60. If f' is frictional resistance per unit wetted area per unit velocity and ρ is density of fluid then Chezy's constant is given by :

(1) $C=\sqrt{\frac{f'}{\rho g}}$ (2) $C=\sqrt{\frac{\rho g}{f'}}$ (3) $C=\sqrt{\frac{\rho}{f'}}$ (4) $C=\sqrt{\frac{f'}{\rho}}$

61. When the pipes are connected in parallel, the total loss of head :

(1) is equal to the sum of the loss of head in each pipe
(2) is same as in each pipe
(3) is equal to the reciprocal of the sum of loss of head in each pipe
(4) none of the above

62. In order to prevent the capillary action from affecting the column of liquid in a pizometer the diameter of the glass tube should be _____.

(1) less than 3 mm (2) more than 3 mm but less than 5 mm
(3) equal to 5 mm (4) greater than 6 mm

63. Surface tension has the units of :

(1) Force per unit area (2) Force per unit length
(3) Force per unit volume (4) None of the above

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

64. Differential manometers are used for measuring :
(1) Velocity at a point in a fluid
(2) Pressure at a point in a fluid
(3) Difference of pressure between two points
(4) None of the above

65. When a liquid from a tank flows through a tap, then total energy will _____.
(1) Increase gradually (2) Decrease suddenly
(3) Remain constant (4) Decrease slowly

66. A circular opening of 'd' m diameter in a vertical side of tank is closed by disc of 'd' m diameter. Calculate the force on disc if head of water above horizontal diameter is 4 m :
(1) $\rho g\frac{\pi}{4}d^2$ (2) $3\rho g\frac{\pi}{4}d^2$ (3) $2\rho g\pi d^2$ (4) $\rho g\pi d^2$

67. Mach Number is defined as the ratio of :
(1) Inertia force to viscous force (2) Inertia force to elastic force
(3) Viscous force to surface tension force (4) Viscous force to elastic force

68. What is the dynamic viscosity of liquid having kinematic viscosity 6 stokes and specific gravity 2 ?
(1) 6 poise (2) 12 poise (3) 18 poise (4) 14 poise

69. If laminar flow of fluid having viscosity 'μ' is flowing through a pipe of diameter 'D' pressure gradient in pipe flow is $-\frac{\partial P}{\partial x}$. What is the average velocity of flow ?
(1) $V=\frac{1}{32\mu}\left(-\frac{\partial P}{\partial x}\right)D^2$ (2) $V=\frac{1}{8\mu}\left(-\frac{\partial P}{\partial x}\right)D^2$
(3) $V=\frac{1}{16\mu}\left(-\frac{\partial P}{\partial x}\right)D^2$ (4) $V=\frac{1}{4\mu}\left(-\frac{\partial P}{\partial x}\right)D^2$

70. The velocity distribution in laminar flow through a pipe follows the law :
(1) Parabolic law (2) Logarithmic law
(3) Linear law (4) Exponential law

71. The range of coefficient of discharge for flow nozzle is _____.
(1) 0.6 to 0.65 (2) 0.95 to 0.98 (3) 0.5 to 0.6 (4) 0.7 to 0.9

72. Which equation is applicable, if there is heat input/output or shaft work output/input during the flow through confined passage problems ?
(1) Bernoulli's equation (2) Euler's equation
(3) Steady flow energy equation (4) Laplace equation

73. Which of the following forces are considered in Reynold's equation of motion ?
(1) Pressure force, gravity force, viscous force and force due to compressibility.
(2) Pressure force, gravity force, viscous force and force due to surface tension.
(3) Pressure force, gravity force, viscous force and force due to turbulance.
(4) Pressure force and gravity force.

74. Which of the following quantity inside the droplets or jet is higher due to the surface tension ?
(1) Temperature (2) Pressure
(3) Viscosity (4) Specific Volume

75. Stoke is the unit of :
(1) Surface tension (2) Viscosity
(3) Kinematic Viscosity (4) None of the above

76. The fraction of the heat input that is converted to net work output is a measure of the performance of a heat engine and is called the _____.
(1) mechanical efficiency (2) volumetric efficiency
(3) thermal efficiency (4) fuel ratio

77. In air standard assumptions, all the processes that make up the cycle are internally _____.
(1) reversible (2) irreversible (3) heated (4) cooled

78. For the steady flow of a liquid through a device, that involves no work interactions, (such as nozzle or a pipe section) the work term is _____.
(1) Zero (2) Maximum (3) Average (4) None of these

79. A cyclic heat engine does 50 kJ of work per cycle. If the efficiency of heat engine is 75%, the heat rejected per cycle is :
(1) 16 kJ (2) 33 kJ (3) 37 kJ (4) 60 kJ

80. The volume flow rate at the outlet of an air compressor is _____ that at the inlet, even though the mass flow rate of air through the compressor is constant.
(1) much less than (2) much greater than
(3) equal to (4) none of these

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

81. Reversed Carnot cycle comprises :
(1) Two isentropic processes and two adiabatic processes.
(2) Two isentropic and two isothermal processes.
(3) Two isentropic and two constant pressure processes.
(4) Two isentropic and two constant volume processes.

82. In steam power plants, the pump handles liquid which has a very small specific volume and the turbine handles vapor whose volume is many times larger. Therefore work output of turbine is _____ the work input to pump.
(1) many times larger than (2) many times smaller than
(3) equal to (4) none of these

83. The isentropic efficiency of a compressor is defined as the ratio of the isentropic compressor work to _____.
(1) adiabatic compressor work (2) isothermal compressor work
(3) actual compressor work (4) isentropic compressor work

84. The change of entropy of closed system :
(1) is same for every process between two specified states
(2) is not same for every process between two specified states
(3) is same only for isothermal process between two specified states
(4) is the same only for reversible process

85. Rankine cycle efficiency of good steam power plant may be in the range of :
(1) 10% to 15% (2) 35% to 45% (3) 70% to 80% (4) 90% to 95%

86. Steam is the most common working fluid used in vapor power cycles because of its _____.
(1) availability (2) low cost
(3) high enthalpy of vaporization (4) all of above

87. The ratio of brake power output to the fuel energy input per unit time is called :
(1) Volumetric efficiency (2) Thermal efficiency
(3) Mechanical efficiency (4) Relative efficiency

88. Four internally reversible processes like :
1 - 2 isentropic compression
2 - 3 constant volume heat addition
3 - 4 isentropic expansion
4 - 1 constant volume heat rejection
This ideal cycle is called _____ cycle.
(1) Diesel (2) Dual (3) Otto (4) None of these

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

89. An artificial satellite revolves around the earth with a relative velocity of 800 m/s. If acceleration due to gravity is 9 m/s^2 and gravitational force is 3600 N, then the mass of satellite is _____.

(1) 4000 kg (2) 400 N (3) 400 kg (4) 450 kg

90. "It is impossible for any device that operates on a cycle to receive heat from a single reservoir and produce a net amount of work". This is a second law of thermodynamics statement expressed by _____.

(1) Kelvin Plank (2) Clausis (3) Rankine (4) Otto

91. In reciprocating engines the ratio of volume at bottom dead center to the volume at top dead center is called _____.

(1) efficiency ratio (2) compression ratio
(3) failure ratio (4) demand ratio

92. Thermal efficiency of closed cycle gas turbine plant is increased by :

(1) reheating (2) intercooling (3) regenerator (4) all of above

93. Which of the following is not positive displacement compressor ?

(1) Roots blower (2) Reciprocating compressor
(3) Vane blower (4) Centrifugal compressor

94. Zeroth law of thermodynamics defines :

(1) Internal energy (2) Enthalpy (3) Temperature (4) Pressure

95. The work input to the air compressor is minimum if compression law followed is :

(1) Isentropic $PV^{\gamma} = C$ (2) Isothermal $PV = C$
(3) $PV^{1.2} = C$ (4) $PV^{1.35} = C$

96. In a three-way catalytic converter, the first converter controls :

(1) HC (2) CO (3) NO_x (4) All the above

97. Mechanical efficiency of an automobile engine usually varies in the range :

(1) 50-60% (2) 60-70%
(3) 70-90% (4) more than 90%

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

98. Unburned hydrocarbons from propane are easier to oxidize in oxidation catalysis than methane, which result in :
(1) low nitrogenoxide emission
(2) high carbon monoxide emissions
(3) low unburned hydrocarbon emissions
(4) high carbon dioxide emissions

---

99. EGR system recirculates a small metered amount of the inert exhaust gas back into the intake manifold :
(1) To reduce the combustion temperature and lower the formation of N_2.
(2) To reduce peak combustion temperature and lower the formation of NO.
(3) To increase peak combustion temperature and lower the formation of NO.
(4) To reduce the exhaust gas temperature and lower the formation of particulate matter.

---

100. The functions of a fuel injection system in diesel engines are :
(1) To filter the fuel and measure the correct quantity of fuel to be injected.
(2) To control the rate of fuel injection and time the fuel injection correctly.
(3) To atomise the fuel into fine particles for complete combustion and properly distribute the fuel in the combustion chamber.
(4) All of these.

---

101. The spark occurs when the :
(1) contact breaker points close
(2) contact breaker points open
(3) ignition switch is on
(4) none of the above

---

102. The thermal efficiency of an air standard diesel cycle having fixed compression ratio, with increase in cut-off will :
(1) increase (2) decrease
(3) independent (4) none of the above

---

103. The stoichiometric ratio of methane is higher than gasoline or diesel fuel because :
(1) methane has a lower percentage of hydrogen
(2) methane has a higher percentage of carbon
(3) methane easily mixed with air
(4) methane has higher percentage of hydrogen

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

104. Octane number of Indian lead-free petrol is :
(1) less than octane number of leaded petrol
(2) equal to octane number of leaded petrol
(3) greater than octane number of leaded petrol
(4) not specified

---

105. Reduction of formation of pollutants is achieved by :
(1) Reducing evaporative emissions
(2) Re-designing the engine
(3) Closed crankcase ventilation
(4) All of these

---

106. The number of main bearings in a 4-cylinder car engine is usually :
(1) 2 (2) 3 (3) 4 (4) 6

---

107. The vibration damper on a crankshaft reduces the :
(1) Longitudinal vibrations (2) transverse vibrations
(3) torsional vibrations (4) all of these

---

108. An indication of auto-ignition quality of a diesel fuel is given by :
(1) octane number (2) detonation
(3) preignition (4) cetane number

---

109. Valve overlap is the number of degrees of crankshaft rotation during which :
(1) both intake and exhaust valve are closed.
(2) both intake and exhaust valve are open.
(3) the valves are moving from fully closed to the timing point.
(4) the valves float.

---

110. The 'dwell' is :
(1) the time for which the points remain closed
(2) the distance between the cam lobes
(3) the angle at which the heat contacts the cam
(4) none of the above

---

111. Class-B push-pull amplifiers have following type of prominent distortion :
(1) Electromagnetic distortion (2) Capacitive distortion
(3) Inductive distortion (4) Crossover distortion

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

112. Diode is an unilateral circuit element because :

(1) it can conduct current in both directions.
(2) it conducts current only in one direction.
(3) it is unsymmetrical in Fabrication.
(4) its power rating is too low.

---

113. The two ends of the dc load line drawn on output characteristics of BJT determine :

(1) saturation and cut-off (2) the operating point
(3) the amplification (4) none of the above

---

114. UJT can be used as relaxation oscillator because of its _____ in the static emitter characteristic curve.

(1) cut-off region (2) saturation region
(3) positive resistance region (4) negative resistance region

---

115. The ratio of base-1 resistance to the interbase resistance (RBI/RBB) is :

(1) known as intrinsic standoff ratio, and it is less than 1.
(2) known as intrinsic standoff ratio, and it is more than 1.
(3) known as extrinsic standoff ratio, and it is less than 1.
(4) known as extrinsic standoff ratio, and it is more than 1.

---

116. Zener diodes are used in :

(1) amplifiers (2) choppers (3) regulators (4) oscillators

---

117. Which of the following interrupt has the highest priority in 8085 ?

(1) INTR (2) TRAP (3) RST 6.5 (4) RST 5.5

---

118. If emitter and collector terminals of BJT are interchanged by mistake, the amplification factor β in this mode will be :

(1) equal to β in normal mode (2) higher than β in the normal mode
(3) lower than β in the normal mode (4) zero

---

119. Common-collector amplifiers are mainly used as :

(1) voltage amplifiers (2) buffers
(3) low input impedance circuits (4) all of the above

---

120. The relationship among instruction cycle (IC), fetch cycle (FC) and execute cycle (EC) is :

(1) IC = FC – EC (2) IC = FC + EC (3) IC = FC + 2 EC (4) EC = IC + FC

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

विभाग - 'ब'

121. Reciprocating pumps are most suited where :

(1) High head are required on mains despite fluctuation in discharge

(2) Operating speeds are much high

(3) Constant supplies are required of large quantity

(4) None of above

---

122. A draft tube converts :

(1) Pressure energy into kinetic energy

(2) Velocity head into potential head

(3) Potential head into pressure head

(4) Kinetic energy into pressure energy

---

123. In a hydraulic crane, if there are "n" number of pully in each pully block, then the velocity ratio will be :

(1) n (2) 2n (3) $\frac{n}{2}$ (4) None of above

---

124. The value of flow ratio in case of francis turbine varies from :

(1) 0.1 to 0.14 (2) 0.15 to 0.30 (3) 0.35 to 0.5 (4) 0.6 to 0.9

---

125. The specific speed of centrifugal pump is :

(1) $\frac{N\sqrt{Q}}{H}$ (2) $\frac{N\sqrt{H}}{Q}$ (3) $\frac{N(H)^{\frac{3}{4}}}{\sqrt{Q}}$ (4) None of above

---

126. For the maximum efficiency for the series of curved vanes, the velocity of vane is :

(1) equal to the jet velocity (2) 75% of the jet velocity

(3) 50% of the jet velocity (4) 33% of the jet velocity

---

127. In a pump there is :

(1) accelerating flow (2) decelerated flow

(3) either of above (4) none of the above

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

128. If specific speed of turbine is 6, then the turbine should be :

(1) Francis (2) Kaplan (3) Pelton wheel (4) Thomson

129. The function of which of the following Hydraulic device is analogous to that of flywheel of reciprocating engine and electric storage battery.

(1) Hydraulic ram (2) Hydraulic accumulator

(3) Hydraulic intensifier (4) Combination of all above

130. Solenoid valve is a valve of :

(1) pressure control valve (2) direction control valve

(3) flow control valve (4) none of above

131. Generator, absorber are component of refrigeration system :

(1) Vapour compression (2) Steam jet

(3) Gas refrigeration (4) Vapour absorption

132. Wet bulb temperature is non property. However it is equal to property. The property is :

(1) Specific humidity (2) Adiabatic saturation temperature

(3) Relative humidity (4) Enthalpy deviations

133. Relative humidity ϕ is ratio of :

(1) mass of water vapour to mass of mixture

(2) mass of air to mass of mixture at same DBT

(3) mass of water vapour to max possible mass of water vapour in mixture at same DBT

(4) none of above

134. Ideal refrigerant should not have :

(1) positive pressure in evaporator

(2) high latent heat of vaporisation

(3) high thermal conductivity

(4) high boiling temperature at atmospheric pressure

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

135. A refrigeration system components are assembled, evacuated and charged by R_{1349}. Which of the following statement is true ?

(1) Thermal capacity of heat pump and refrigerating machine will be same.

(2) Thermal capacity of refrigerating machine will be higher than heat pump.

(3) Heat pump will have higher thermal capacity than refrigerating machine.

(4) Thermal capacity relationship can not be predicted.

---

136. Halocarbon compound designated as R-22 (Refrigerant) has chemical formula :

(1) CCL_2F_2 (2) CCL_3F (3) $CHCLF_2$ (4) $CHCL_2F$

---

137. Domestic Refrigerator are specified by :

(1) cool space volume (2) heat transfer rate alone

(3) color of front panel (4) none of the above

---

138. Air conditioning is simultaneous control of :

(1) DBT, relative humidity, air purity and motion

(2) DBT, air purity

(3) Only DBT

(4) DBT and humidity

---

139. In operation theater air conditioning application, recirculation air percentage will be :

(1) 20% (2) 50% (3) zero% (4) 80%

---

140. Vapour absorption refrigeration system uses _____ as input energy.

(1) electricity only (2) water energy only

(3) low grade heat energy (4) non conventional energy only

---

141. In order to indicate sequence of events and movements of men, material, etc., while work is being accomplished, the recording technique used is :

(1) Flow diagram (2) Flow process chart

(3) Gang process chart (4) Two handed process chart

---

142. _____ is recommended for the batch production.

(1) Process layout (2) Product layout

(3) Group layout (4) Fixed position layout

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

143. Which of the following is the measure of dispersion ?

(1) Median (2) Range and standard deviation

(3) Mode (4) Arithmetic mean

---

144. Which of the following control chart is used for controlling number of defects per piece ?

(1) R chart (2) P chart (3) C chart (4) U chart

---

145. Gantt chart provides information about :

(1) Material Flow (2) Production Schedule

(3) Resource Planning (4) None of above

---

146. The primary function of a _____ is to produce a record of an existing set of conditions so that the job of seeing what is actually taking place is made as simple as possible.

(1) Flow diagram (2) String diagram

(3) Operation process chart (4) None of above

---

147. During limit gauging for acceptance of product :

(1) No Go plug gauge should not enter the product

(2) No Go ring gauge should not pass over solid

(3) Both

(4) None

---

148. Standards to be used for reference purposes in laboratories and workshops are referred as :

(1) Primary standards (2) Secondary standards

(3) Tertiary standards (4) Working standards

---

149. The surface roughness on a drawing is represented by :

(1) Circles (2) Squares

(3) Curves (4) Inverted triangles

---

150. Variation traced in product because of error in setting jigs and fixture are treated as :

(1) Assignable cause (2) Chance cause

(3) None of above (4) Can be treated in any category

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

विभाग - 'क'

151. A typical overdrive gear ratio is _____.

(1) 0.8 : 1 (2) 1 : 1 (3) 1.5 : 1 (4) 3.5 : 1

---

152. Which of the following is **not** used as material for automotive frames ?

(1) carbon steel (2) cast iron (3) alloy steel (4) aluminium

---

153. The purpose of transmission in an automobile is :

(1) to vary the speed of automobile

(2) to vary the torque at the road wheels

(3) to vary the propulsion power of automobile

(4) All of the above

---

154. Desired slip rate in case of ABS of a road vehicle is :

(1) 0% (2) 10 - 30% (3) 100% (4) 80 - 90%

---

155. Which of the following shall have minimum air drag coefficient ?

(1) saloon car (2) articulated truck

(3) light van (4) buses and coaches

---

156. The purpose of tyre plies is to :

(1) increase tread life (2) decrease noise level

(3) provide softer ride (4) increase traction

---

157. In an automotive brake system, balance between front and rear braking is ensured with the help of :

(1) master cylinder (2) proportioning valve

(3) metering valve (4) differential switch

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

158. Anti-roll bar/stabilizer bar is advised to be used at :

(1) front only (2) rear only

(3) front as well as rear (4) either (1) or (2)

---

159. A tyre is designated as P 205/65 R12. Aspect ratio of this tyre is :

(1) 205 (2) 100 (3) 65 (4) 12

---

160. Following is the data for transmission system of a road vehicle.

Gearbox reduction ratios :

1st gear - 4.3 : 1

2nd gear - 3.00 : 1

3rd gear - 2.71 : 1

4th gear - 1 : 1

Final drive reduction is 5.0 : 1

The overall reduction when the vehicle is driven in 2nd gear is :

(1) 3.00 : 1 (2) 13.55 : 1 (3) 5 : 1 (4) 15 : 1

---

161. A fully charged 6 cell automotive battery should indicate :

(1) 12 V (2) 12.6 V

(3) Specific gravity of 1.290 at 32°C (4) Both (2) and (3)

---

162. The PCV valve is located between the :

(1) air cleaner and the carburettor

(2) carburettor and the intake manifold

(3) intake manifold and air cleaner

(4) intake manifold and crankcase

---

163. For measuring clearance between two flat surfaces the tool used is the :

(1) steel rule (2) caliper (3) micrometer (4) fealer gauge

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

164. In case of an automobile battery, following are the reasons which will cause a defect of _____.

(a) Very high charging rate

(b) High specific gravity of electrolyte

(c) Freezing of electrolyte

(d) Improper level of electrolyte

(e) Mechanical damage due to rough handling or not fixed in the vehicle

Answer options :

(1) Loss of water

(2) Deterioration of plates

(3) Corrosion of terminals and clamps

(4) Internal short circuiting

---

165. A chassis dynamometer measures the vehicle power at the :

(1) engine crankshaft (2) transmission shaft

(3) wheels (4) none of these

---

166. About how much percentage of heat energy equivalent is lost in overcoming engine friction ?

(1) 30% - 40% (2) 20% - 30% (3) 15% - 25% (4) 5% - 10%

---

167. Clutch dragging is noticeable :

(1) when shifting gears (2) during acceleration

(3) at high speed (4) at low speed

---

168. Approximate values of crankshaft run out and wear limit of clutch plates, generally lie within :

(1) 0.03 mm, 0.3 mm (2) 0.3 mm, 3.0 mm

(3) 0.001 mm, 0.01 mm (4) 0.1 mm, 1.0 mm

---

169. The capacity of a battery is expressed in terms of :

(1) current rating (2) voltage rating

(3) ampere-hour rating (4) none of the above

कच्च्या कामासाठी जागा /SPACE FOR ROUGH WORK

170. Scuff wear is caused by :

(1) abrasive wear

(2) momentary welds at TDC

(3) momentary welds at BDC

(4) excessive oil in the combustion chamber

---

171. A registration certificate issued in any province is valid throughout India, and is valid for _____ years.

(1) 9 (2) 5 (3) 15 (4) 20

---

172. For how much period driving licence is disqualified to drive under the influence of drink or drugs ?

(1) 6 months (2) 24 months (3) 12 months (4) 18 months

---

173. Which form number and rules are applicable for assignment of new registration mark on removal of a motor vehicle of another state ?

(1) 25, 52 (2) 27, 54 (3) 12, 24 (4) 30, 55

---

174. The specified age of tourist bus and goods carriage is _____ years.

(1) 5 (2) 9 (3) 15 (4) 20

---

175. Motor Vehicle Act 1988 has _____ chapters and _____ schedules.

(1) 20, 4 (2) 14, 2 (3) 22, 2 (4) 18, 1

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176. According to Bombay Motor Vehicle Tax Act 1958, tax exemption for school buses owned by school authorities and used exclusively as school buses is :

(1) $\frac{2}{3}$rd of annual tax rate applicable

(2) $\frac{1}{3}$rd of annual tax rate applicable

(3) $\frac{1}{2}$ of annual tax rate applicable

(4) $\frac{1}{5}$ of annual tax rate applicable

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177. As per section 161 of Motor Vehicle Act 1988, in respect of death of any person resulting from a hit and run motor accident, a sum of _____ is fixed as a compensation.
(1) ₹ 25,000 (2) ₹ 15,000 (3) ₹ 75,000 (4) ₹ 80,000

178. Which of the following types of insurances is mandatory ?
(1) Motor own damage (2) Motor third party legal liability
(3) Personal accident insurance (4) Professional liability

179. Bharat Stage II (equivalent to Euro II) norms for cars and commercial vehicles were enforced in the entire country on _____.
(1) August 1, 2005 (2) April 1, 1988
(3) April 1, 2000 (4) April 1, 2005

180. If the vehicle is fitted with pneumatic tyre and it is a medium or heavy passenger motor vehicle, the maximum speed per hour in kilometer is _____.
(1) 40 (2) 60 (3) 50 (4) 70

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सूचना — (पृष्ठ 1 वरून पुढे....)

(8) **प्रश्नपुस्तिकेमध्ये** विहित केलेल्या विशिष्ट जागीच कच्चे काम (रफ वर्क) करावे. प्रश्नपुस्तिकेव्यतिरिक्त उत्तरपत्रिकेवर वा इतर कागदावर कच्चे काम केल्यास ते कॉपी करण्याच्या उद्देशाने केले आहे, असे मानले जाईल व त्यानुसार उमेदवारावर शासनाने जारी केलेल्या "परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचे अधिनियम-82" यातील तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एक वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.

(9) सदर प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपल्यानंतर उमेदवाराला ही प्रश्नपुस्तिका स्वत:बरोबर परीक्षाकक्षाबाहेर घेऊन जाण्यास परवानगी आहे. **मात्र परीक्षा कक्षाबाहेर जाण्यापूर्वी उमेदवाराने आपल्या उत्तरपत्रिकेचा भाग-1 समवेक्षकाकडे न विसरता परत करणे आवश्यक आहे.**

नमुना प्रश्न

प्र. क्र. 201. The Catch varies inversely with the size of the :

(1) nozzle (2) droplet

(3) obstruction (4) sprayer

ह्या प्रश्नाचे योग्य उत्तर "(3) obstruction" हे आहे. त्यामुळे या प्रश्नाचे उत्तर "(3)" होईल, आता खालीलप्रमाणे प्रश्न क्र. 201 समोरील उत्तर-क्रमांक "③" हे वर्तुळ खालीलप्रमाणे पूर्णपणे छायांकित करून दाखविणे आवश्यक आहे.

प्र. क्र. 201. ① ② ● ④

अशा पद्धतीने प्रस्तुत प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाचा तुमचा उत्तरक्रमांक हा तुम्हाला स्वतंत्ररीत्या पुरविलेल्या उत्तरपत्रिकेवरील त्या त्या प्रश्नक्रमांकासमोरील संबंधित वर्तुळ पूर्णपणे छायांकित करून दाखवावा. **ह्याकरिता फक्त काळ्या शाईचे बॉलपेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.**

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