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परीक्षा दि. 20 नोव्हेंबर, 2021

प्रश्नपुस्तिका क्रमांक 2020

BOOKLET No.

प्रश्नपुस्तिका **F14** संच क्र. **A**

104973

यंत्र अभियांत्रिकी स्वयंचल अभियांत्रिकी/
यंत्र अभियांत्रिकी/स्वयंचल अभियांत्रिकी

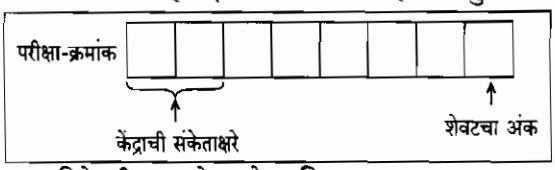
वेळ : $1\frac{1}{2}$ (दीड) तास

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.

(2) आपला परीक्षा-क्रमांक ह्या चौकोनांत **न विसरता बॉलपेनने** 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 बॉलपेन 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. एका पेक्षा जास्त उत्तरे नमूद केल्यास ते उत्तर चुकीचे धरले जाईल व त्या चुकीच्या उत्तराचे गुण वजा केले जातील.

(7) **प्रस्तुत परीक्षेच्या उत्तरपत्रिकांचे मूल्यांकन करताना उमेदवाराच्या उत्तरपत्रिकेतील योग्य उत्तरांनाच गुण दिले जातील. तसेच ''उमेदवाराने वस्तुनिष्ठ बहुपर्यायी स्वरूपाच्या प्रश्नांची दिलेल्या चार उत्तरांपैकी सर्वात योग्य उत्तरेच उत्तरपत्रिकेत नमूद करावीत. अन्यथा त्यांच्या उत्तरपत्रिकेत सोडविलेल्या प्रत्येक चुकीच्या उत्तरांसाठी 25% किंवा 1/4 गुण वजा/कमी 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 उमेदवाराला 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 शेवटच्या पानावर पहा

पर्यवेक्षकांच्या सूचनेशिवाय हे सील उघडू नये

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

विभाग 'अ'

1. In climb milling
   (1) work moves in the same direction as rotation of the cutter.
   (2) work moves in the opposite direction as rotation of the cutter.
   (3) tool climbs on the workpiece for cutting operation.
   (4) work is fed to cutter in lateral direction.

2. The machining process that will be most appropriate to drill a rectangular hole in ceramic material is
   (1) Drilling Machining (2) Ultrasonic Machining
   (3) Electric Discharge Machining (4) Chemical Machining

3. Ferrous metals include which of the following ?
   (1) Cast iron, Aluminium (2) Cast iron, Steel
   (3) Steel, Copper (4) Steel, Aluminium

4. Which of the following is desired in materials used for springs ?
   (1) Stiffness (2) Toughness (3) Resilience (4) Elasticity

5. The machinability of steel is improved by adding
   (1) Nickel and Chromium (2) Nickel
   (3) Chromium (4) Sulphur, Lead and Phosphorus

6. Which one of the following is a machine used to perform extrusion ?
   (1) Forge hammer (2) Milling machine
   (3) Press machine (4) Torch

7. Crater wear is predominant in
   (1) Carbon steel tools (2) Tungsten carbide tools
   (3) High speed steel tools (4) Ceramic tools

8. The dielectric fluid in Electric Discharge Machining (EDM) process should

(1) ionise rapidly after the spark discharge has taken place.

(2) have a high viscosity.

(3) be chemically neutral so as to not attack the electrode.

(4) have a low flash point.

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9. Which one of the following materials has the highest hardness ?

(1) Aluminium oxide (2) Cubic boron nitride

(3) HSS (4) Tungsten carbide

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10. A drill will not cut if

(1) Helix angle is small. (2) Lip angle is zero.

(3) Lips are of unequal length. (4) The flutes get filled up with chips.

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11. A drill bit of 20 mm diameter rotating at 500 rpm with a feed rate of 0·2 mm/revolution is used to drill a through-hole in a mild steel plate of 20 mm thickness. The depth of cut in this drilling operation is

(1) 0·2 mm (2) 10 mm

(3) 20 mm (4) 2 mm

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12. Of the following processes, which one is noted for the highest material removal rates ?

(1) Electric discharge machining (2) Laser beam machining

(3) Water jet cutting (4) Plasma arc cutting

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13. The process of removal of metal by means of an elongated tool having a number of successive teeth of enlarging size is called

(1) Boring (2) Reaming

(3) Broaching (4) Hobbing

---

14. Higher work speeds in grinding cause

(1) Increased heat produced (2) Increased wheel wear

(3) Improved surface finish (4) Decreased wheel wear

15. Suggest the machine to be used for accurate cutting of teeth of internal spur gears.

(1) Milling (2) Hobbing (3) Forming (4) Gear shaper

16. The APT command GORGT is which of the following ?

(a) Continuous path command

(b) Geometry statement involving a volume of revolution about a central axis

(c) Point to point command

(d) Tool path command in which the tool must go right in the next move

(1) (a) and (d) (2) (a) and (b)

(3) (b) and (d) (4) (b) and (c)

17. In a centre lathe, the spindle speed will be lowest during

(1) Taper turning (2) Thread cutting

(3) Parting off (4) Knurling

18. Ability of material to undergo large permanent deformation in tension is known as

(1) Toughness (2) Plasticity (3) Stiffness (4) Hardness

19. The surface of a slip gauge is produced by

(1) Milling (2) Grinding (3) Burnishing (4) Lapping

20. A unique advantage of CNC systems is that a diagnostic program can be executed on its

(1) Microcontroller (2) Computer

(3) Microprocessor (4) None of the above

21. The screws are termed as self-locking screws when _____.

(1) angle of friction is less than helix angle

(2) angle of friction is equal to helix angle

(3) angle of friction is more than helix angle

(4) angle of friction is twice the helix angle

---

22. In the 'Criteria of constraint', J + 0·5H = 1·5L – 2, if Left-hand side > Right-hand side

(1) Chain is locked (2) Chain is constrained

(3) Chain is unconstrained (4) None of the above

---

23. Which one of the following mechanisms represents an inversion of single slider crank chain ?

(1) Elliptical trammel

(2) Oldham's coupling

(3) Whitworth quick return mechanism

(4) Pantograph mechanism

---

24. Instantaneous centre of rotation of round disc rolling on straight horizontal path without slipping has its centre of rotation

(1) At the centre of gravity of the disc

(2) At the centre of the circle whose diameter is equal to diameter of the disc

(3) At the point of contact of the disc with straight horizontal path

(4) None of the above

---

25. The acceleration of piston of a reciprocating engine is _____.

(1) $r\omega^2\left[\sin\theta + \frac{\sin 2\theta}{n}\right]$ (2) $r\omega\left[\cos\theta + \frac{\cos 2\theta}{n}\right]$

(3) $r\omega^2\left[\cos\theta + \frac{\cos 2\theta}{4n}\right]$ (4) $r\omega^2\left[\cos\theta + \frac{\cos 2\theta}{n}\right]$

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26. The efficiency of screw jack _____.

(1) increases with increase in pitch of the screw jack

(2) decreases with increase in load on jack

(3) decreases with increase in pitch of the screw jack

(4) increases with increase in load on jack

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27. A constrained kinematic chain is known as a mechanism when

(1) None of the links are fixed (2) One of the links is fixed

(3) Two of the links are fixed (4) None of the above

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28. The power from the engine gear box to the rear axle of an automobile is transmitted by means of

(1) worm and worm wheel (2) spur gear

(3) bevel gear (4) Hooke's joint

29. Which of the following involves designing of machine elements related to its shape and size ?

(1) Kinetics (2) Kinematics

(3) Dimensional Synthesis (4) All of the above

30. When the semicone angle increases, the torque transmitting capacity of cone clutch

(1) Increases (2) Decreases

(3) Remains constant (4) None of the above

31. Multi disk clutches are

(1) Dry running clutches (2) Wet running clutches

(3) Having high coefficient of friction (4) None of the above

32. Which lubricant is used in a rope brake dynamometer ?

(1) Water (2) Oil

(3) Grease (4) No lubricant

33. While the pitching of a ship is upwards, the effect of gyroscopic couple acting will tend to move the ship

(1) towards starboard

(2) towards port side

(3) to raise the bow and lower the stern

(4) to raise the stern and lower the bow

34. For high speed engine applications, the best motion suggested for cam follower is

(1) uniform velocity

(2) simple harmonic motion

(3) uniform acceleration and retardation

(4) cycloidal motion

35. The ratio of height of a Porter governor to that of a Watt governor when the length of the links and the arms are same is given by _____.

(1) $\frac{M + m}{M}$ (2) $\frac{M + m}{m}$

(3) $\frac{M}{M + m}$ (4) $\frac{m}{M + m}$

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36. In a cam follower motion, the follower has constant acceleration when it moves with _____.

(1) simple harmonic motion (2) cycloidal motion

(3) polynomial motion (4) parabolic motion

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37. If the controlling force of a governor increases with increase in speed, the governor is said to be

(1) sensitive (2) insensitive

(3) isochronous (4) unstable

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38. The efficiency of a screw jack is maximum when

(1) $\alpha = 45° - \frac{\phi}{4}$ (2) $\alpha = 45° + \frac{\phi}{4}$

(3) $\alpha = 45° - \frac{\phi}{2}$ (4) $\alpha = 45° + \frac{\phi}{2}$

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39. An imaginary circle which by pure rolling action provides the same motion as the actual gear is known as _____.

(1) Base circle (2) Pitch circle

(3) Addendum circle (4) Dedendum circle

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40. In a reverted gear train, the axes of the first and last gear are _____.

(1) parallel

(2) skew

(3) coaxial

(4) perpendicular to each other

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41. Printer ink is an example of _____.

(1) Elastic solid

(2) Newtonian fluid

(3) Thyxotropic substance

(4) Non-Newtonian fluid

42. Surface tension is expressed in _____

(1) N/m (2) N/m^2

(3) N^2/m (4) N/m^3

43. The value of bulk modulus of elasticity _____ with increase in pressure.

(1) increases (2) decreases

(3) Either of the above (4) None of the above

44. Which of the following is an advantage of manometers used in flow measurement ?

(1) Good Accuracy (2) High Sensitivity

(3) Little Maintenance (4) All of the above

45. The total energy represented by Bernoulli's equation $\left(\frac{p}{\omega} + \frac{V^2}{2g} + z\right)$ has units

(1) Nm/s (2) Ns/m

(3) Nm/m (4) Nm/kg

46. If the Reynolds number is less than 2000, the flow in the pipe is _____.

(1) Turbulent flow (2) Laminar flow

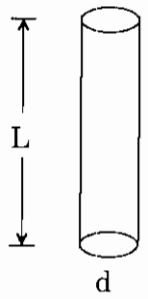
(3) Transition flow (4) None of the above

47. The piezometer measures _____ pressure only.

(1) Absolute (2) Gauge

(3) Atmospheric (4) Any of the above

48. Consider a liquid jet of diameter 'd' and length 'L' as shown in the figure.



The pressure intensity inside the liquid jet above the outside pressure is expressed as _____, where σ = surface tension on the liquid.

(1) $P = \frac{\sigma \times 2L}{L \times d}$ (2) $P = \frac{\sigma}{L \times d}$

(3) $P = \frac{\sigma \times 2L}{d}$ (4) None of the above

---

49. Surface tension phenomenon is illustrated through the following example :

(1) Rain drop (2) Rise of sap in tree

(3) Break up of liquid (4) All of the above

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50. In case of Laminar Flow, the loss of Pressure head is proportional to

(1) Velocity (2) $Velocity^2$

(3) $Velocity^3$ (4) None of the above

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51. The pressure gradient in the direction of flow is equal to the shear gradient in the direction

(1) Parallel to the direction of flow (2) Normal to the direction of flow

(3) Either of the above (4) None of the above

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52. A turbulent flow is considered to be a steady flow when

(1) the algebraic sum of velocity fluctuation is zero.

(2) the velocity at a point does not change with time.

(3) temporal mean velocity at a point remains constant with time.

(4) the discharge remains constant.

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53. The shear in turbulent flow is mainly due to

(1) heat transfer (2) mass transfer

(3) momentum transfer (4) All of the above

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54. Intensity of turbulence is _____.

(1) the average kinetic energy of turbulence

(2) the violence of turbulence fluctuation and measured by root mean square value of velocity fluctuation

(3) the mean time interval between the reversals in the sign of velocity fluctuation

(4) None of the above

55. If the flow is irrotational as well as steady, it is known as _____.

(1) non-uniform flow (2) one-dimensional flow

(3) potential flow (4) None of the above

56. _____ is a curve which gives an instantaneous picture of the location of fluid particles which have passed through a given point.

(1) Path line (2) Stream line

(3) Streak line (4) None of the above

57. In a steady flow, the velocity

(1) does not change from place to place.

(2) at a given point does not change with time.

(3) may change its direction but the magnitude remains unchanged.

(4) None of the above

58. In a forced vortex,

(1) the fluid velocity is inversely proportional to the radius.

(2) the fluid rotates without any relative velocity.

(3) the rise depends upon the specific weight.

(4) the rise is proportional to the cube of angular velocity.

59. The taper of divergent cone of venturimeter is in range of

(1) 20° to 23° (2) 5° to 8°

(3) 60° to 65° (4) None of the above

60. Which fluid among the following fluids has maximum surface tension ?

(1) Water (2) Kerosene (3) Glycerine (4) Mercury

61. A process in which the temperature of the working substance remains constant during expansion or compression is called _____.

(1) adiabatic process (2) isothermal process

(3) polytropic process (4) hyperbolic process

62. The measurement of a temperature is based upon _____.

(1) Zeroth law of thermodynamics

(2) First law of thermodynamics

(3) Second law of thermodynamics

(4) Newton's law of cooling

63. No heat engine can operate by exchanging heat from a single temperature source. This is _____.

(1) Clausius statement

(2) Carnot theorem

(3) Kelvin-Planck statement

(4) Joule's law

64. In a Carnot cycle, the addition and rejection of heat takes place at a

(1) constant pressure (2) constant volume

(3) constant temperature (4) constant enthalpy

65. Conversion of heat into work requires some special devices. Such devices are called _____.

(1) Cycles (2) Processes

(3) Machines (4) Heat Engines

66. In the Rankine cycle, the heat is added _____.

(1) isothermally (2) at constant volume

(3) at constant pressure (4) adiabatically

67. Which one of the following is the most popular vapour power cycle ?

(1) Carnot Cycle (2) Rankine Cycle

(3) Joule Cycle (4) Binary Cycle

68. Calculate the free air delivery (FAD) of a compressor for the following data :

Receiver capacity = 0·25 m^3, Initial pressure = 1 bar, Final pressure = 13 bar, Initial temperature = 22°C, Final temperature = 42°C, Additional hold up volume = 0·05 m^3, Compressor pump up time = 3·9 minutes.

(1) 0·88 (2) 0·83 (3) 0·45 (4) 0·9

69. A vessel having a volume of 0·6 m^3 contains 3 kg of liquid water and water vapour mixture in equilibrium. The specific volume of mixture is _____.

(1) 0·2 m^3/kg (2) 0·5 m^3/kg

(3) 1·8 m^3/kg (4) 5 m^3/kg

70. For the same compression ratio, the efficiency of Dual cycle is

(1) lesser than Diesel cycle.

(2) greater than Diesel cycle.

(3) lesser than Diesel cycle and greater than Otto cycle.

(4) greater than Diesel cycle and lesser than Otto cycle.

71. Otto cycle is also known as

(1) Constant volume cycle (2) Constant pressure cycle

(3) Constant temperature cycle (4) Constant weight cycle

72. The efficiency of the Carnot engine using an ideal gas as working substance is

(1) $\frac{T_H - T_L}{T_H}$ (2) $\frac{T_H - T_L}{T_H T_L}$ (3) $\frac{T_H}{T_H - T_L}$ (4) $\frac{T_L}{T_H - T_L}$

73. The energy coming from outer atmosphere is _____.

(1) Stored energy (2) Capital energy

(3) Celestial energy (4) Transitional energy

74. A gas contained in a cyclinder is compressed, the work required for compression being 5000 kJ. During this process, heat interaction of 2000 kJ causes the surroundings to be heated. The change in internal energy of the gas during the process is

(1) – 7000 kJ (2) – 3000 kJ (3) + 3000 kJ (4) + 7000 kJ

75. The law of thermodynamics, which states that heat and work are mutually convertible is known as

(1) Zeroth law of thermodynamics.

(2) First law of thermodynamics.

(3) Second law of thermodynamics.

(4) Third law of thermodynamics.

---

76. The free expansion process is a

(1) constant volume process.

(2) constant pressure process.

(3) constant enthalpy process.

(4) constant temperature process.

---

77. Carnot cycle has maximum efficiency for

(1) Petrol engine (2) Diesel engine

(3) Reversible engine (4) Irreversible engine

---

78. The compressor efficiency of a reciprocating air compressor is given by

(1) $\frac{\text{Indicated Power}}{\text{Isothermal Power}}$ (2) $\frac{\text{Isothermal Power}}{\text{Indicated Power}}$

(3) $\frac{\text{Isothermal Power}}{\text{Brake Power}}$ (4) $\frac{\text{Brake Power}}{\text{Isothermal Power}}$

---

79. Heat is transferred to a heat engine from a furnace at a rate of 90 MW. If the rate of waste heat rejection to a nearby river is 55 MW, determine the net power output.

(1) 35 MW (2) 145 MW (3) – 45 MW (4) 0 MW

---

80. In a reciprocating air compressor, the work input is minimum when compression is _____.

(1) isentropic (2) isothermal

(3) isobaric (4) polytropic

---

81. Increase of torque in a vehicle is obtained by _____.

(1) decreasing speed (2) decreasing power

(3) decreasing fuel consumption (4) All of the above

82. Cylinder blocks of IC engines are commonly made of _____.

(1) Grey cast iron

(2) Alloy cast iron (Ni or Cr as alloying element)

(3) Aluminium alloy

(4) All of the above

83. Compression ratio of petrol engine is in the range of _____.

(1) 2 to 3

(2) 7 to 9

(3) 16 to 20

(4) None of the above

84. The ratio of mass of air (or mixture) retained to the mass of trapped cylinder charge is called as _____.

(1) Trapping efficiency (2) Scavenging efficiency

(3) Charging efficiency (4) Volumetric efficiency

85. Viscosity of an oil tends to deviate from its standard value during operation. Which of the following factors are responsible for such deviation ?

(1) Temperature and Pressure

(2) Degradation of oil additives and presence of oxidation products

(3) Both (1) and (2)

(4) None of the above

86. How many times in a minute does each valve on a 4-stroke engine running at 2000 rpm open and close ?

(1) 1000 (2) 2000 (3) 4000 (4) 6000

87. In SI engines, to obtain required firing order

(a) battery is installed.

(b) distributor is installed.

(c) carburettor is installed.

(d) ignition coil is installed.

Which of the above statements is/are correct ?

(1) (a) only (2) (b) only (3) (a) and (c) only (4) (a), (c) and (d) only

88. Increase in the compression ratio offers the following advantage :

(1) Increased load carrying capacity

(2) Increased engine power

(3) Increased speed and enhanced economy

(4) All of the above

89. Excess air factor is

(1) the ratio of stoichiometric to actual air/fuel ratio

(2) the ratio of lean air/fuel to rich air/fuel ratio

(3) the ratio of rich air/fuel to lean air/fuel ratio

(4) the ratio of actual to stoichiometric air/fuel ratio

90. Excessive oil consumption in an automobile is due to _____.

(1) use of low viscosity oil (2) defective valve seal

(3) improper piston ring gap (4) All of the above

91. In a 4-cylinder petrol engine, the standard firing order is

(a) 1 – 2 – 3 – 4

(b) 1 – 4 – 2 – 3

(c) 1 – 3 – 2 – 4

(d) 1 – 3 – 4 – 2

Which of the above is/are correct ?

(1) (a) only (2) (a) and (b) only

(3) (a), (b) and (c) only (4) (d) only

92. The detachable dry liner in the form of plain sleeve is pressed into the cast iron or aluminium alloy cylinder block with _____.

(1) clearance fit (2) shrink fit

(3) transition fit (4) interference fit

93. Volumetric efficiency of LPG fuelled engine is improved by

(1) Increasing the size of the induction tracts.

(2) Increasing the inlet pressure with turbocharger or supercharger.

(3) Increasing the size of valves.

(4) All of the above

94. The net work per cycle done by the piston on the cylinder gases during the inlet and exhaust stroke is called as

(1) Pumping work

(2) Rubbing friction work

(3) Accessory work

(4) Total friction work

---

95. If BP of a four-stroke petrol engine is 28 kW and mechanical efficiency is 80%, then IP is _____.

(1) 3·5 kW

(2) 35 kW

(3) 22·4 kW

(4) None of the above

---

96. A P-N diode, when working as a switch, has ideally

(1) Zero resistance when ON and infinite resistance when OFF.

(2) Zero resistance when OFF and infinite resistance when ON.

(3) Identical resistance when ON or OFF.

(4) None of the above

---

97. P-N junction diode is operated in

(1) Reverse Biased Condition

(2) Forward Biased Condition

(3) Both in Forward and Reverse Biased Condition

(4) Other than all the above conditions

---

98. The UJT will produce an output pulse when _____.

(1) the voltage across $B_2 - E$ exceeds the break over voltage level

(2) the voltage across $B_1 - E$ exceeds the break over voltage level

(3) the voltage across $B_1 - B_2$ exceeds the break over voltage level

(4) None of the above

---

99. UJT, when connected as a Relaxation Oscillator, is used to trigger

(1) Diode (2) BJT

(3) SCR (4) Any of the above

---

100. The common base amplifier has

(1) voltage gain of less than unity but current gain of more than unity.

(2) voltage gain of more than unity but current gain of less than unity.

(3) voltage and current gains of more than unity.

(4) voltage and current gains of less than unity.

---

101. To bias the transistor in its active region emitter base junction is _____ while collector base junction is _____.

(1) Forward biased, Reverse biased

(2) Reverse biased, Forward biased

(3) Reverse biased, Reverse biased

(4) Forward biased, Forward biased

---

102. Voltage gain of an op-amp is given by (Given A_v = Voltage gain, V_i = Input voltage, V_o = Output voltage)

(1) $A_v = V_o V_i$ (2) $A_v = V_i / V_o$

(3) $A_v = V_o / V_i$ (4) $A_v = V_i + V_o$

---

103. What is the current gain for a common base configuration when I_E = 1 mA and I_C = 0·9 mA ?

(1) 0·9 (2) 1·11 (3) 10 (4) 9

---

104. The term _____, as used in microprocessor terminology, identifies the location or the destination of data.

(1) CPU (2) ALU (3) Hex (4) Address

---

105. The definite time taken by a microprocessor to perform a specific task is called the

(1) Machine cycle (2) Fetch cycle

(3) Instruction cycle (4) Clock cycle

---

106. Two bars of different materials and same size are subjected to the same tensile force. If the bars have unit elongation in the ratio of 2 : 5, then the ratio of modulus of elasticity of the two materials will be

(1) 2 : 5 (2) 5 : 2 (3) 4 : 3 (4) 3 : 4

107. Which of the following is a proper sequence ?

(1) Proportional limit, Elastic limit, Yielding, Failure
(2) Elastic limit, Proportional limit, Yielding, Failure
(3) Yielding, Elastic limit, Proportional limit, Failure
(4) Yielding, Proportional limit, Failure, Elastic limit

108. If τ is the uniform shear stress developed in a material having modulus of rigidity 'G', what is the strain energy stored in the material ?

(1) $U = \frac{1}{2} \times \tau^2 \times \text{Volume}$ (2) $U = \frac{1}{2} \times \frac{\tau^2}{G} \times \text{Volume}$

(3) $U = \frac{\tau^2}{2G} \times \text{Area}$ (4) $U = \frac{1}{2} \times \frac{\tau^2}{G}$

109. Strain energy is the

(1) energy stored in a body when strained within elastic limits.
(2) energy stored in a body when strained up to the breaking of a specimen.
(3) the maximum energy that can be stored in a body.
(4) modulus of toughness of a material.

110. When shear force at a point is zero, then bending moment at that point will be

(1) Zero (2) Minimum (3) Maximum (4) Infinity

111. When the shear force diagram is a parabolic curve between two points, it indicates that there is a

(1) uniformly varying load between the two points.
(2) uniformly distributed load between the two points.
(3) point load at the centre of the two points.
(4) point load at the two points.

112. The bending stress in a beam is _____ the bending moment.

(1) equal to (2) less than
(3) more than (4) directly proportional to

113. A beam of length 'L' and coefficient of thermal expansion 'α' is fixed at two ends without stress. If the temperature of the beam is dropped by T°C, what is the axial force developed in the beam ?

(1) $AE\alpha T$ (Tensile) (2) $\frac{AE}{\alpha T}$ (Tensile)

(3) $A\alpha TE$ (Compressive) (4) $\frac{AE}{\alpha T}$ (Compressive)

114. The unit of modulus of elasticity is same as those of

(1) stress, strain and pressure.
(2) stress, force and modulus of rigidity.
(3) strain, force and pressure.
(4) stress, pressure and modulus of rigidity.

115. Limit of eccentricity for a rectangular section of width (b) and thickness (d) for no tension condition is

(1) $\leq \frac{1}{6}d$ (2) $\leq \frac{1}{6}d^2$ (3) $\leq \frac{1}{6}b^2$ (4) $\leq \frac{1}{6}b$

116. The equivalent length of a column (l) supported firmly at both ends is

(1) $\frac{l}{8}$ (2) $\frac{l}{4}$ (3) $\frac{l}{2}$ (4) l

117. Torque transmitted by a solid shaft of diameter (D), when subjected to a shear stress (τ) is

(1) $\frac{\pi}{16} \times \tau \times D^2$ (2) $\frac{\pi}{16} \times \tau \times D^3$

(3) $\frac{\pi}{32} \times \tau \times D^2$ (4) $\frac{\pi}{32} \times \tau \times D^3$

118. In a thin cylindrical shell subjected to an internal pressure p, the ratio of longitudinal stress to circumferential stress in the shell is

(1) $\frac{1}{2}$ (2) $\frac{3}{4}$ (3) 1 (4) 2

119. Theorem of perpendicular axis is used in obtaining the moment of inertia of a

(1) Semicircular lamina (2) Square lamina
(3) Circular lamina (4) Triangular lamina

120. The strain energy density of a material when it is stressed to the proportional limit is called as

(1) Modulus of elasticity (2) Modulus of resilience
(3) Shear modulus (4) Modulus of toughness

कच्च्या कामासाठी जागा / SPACE FOR ROUGH WORK

विभाग 'ब'

121. The capacity of a domestic refrigerator is in the range of
(1) 0·1 to 0·2 TR (2) 1 to 2 TR
(3) 2 to 3 TR (4) 3 to 4 TR

122. The condition of refrigerant at the inlet to the compressor should be
(1) wet (2) dry
(3) slightly superheated (4) None of the above

123. A condenser of a refrigeration system rejects heat at a rate of 120 kW, while its compressor consumes power of 30 kW. The coefficient of performance is
(1) 0·25 (2) 0·33 (3) 3 (4) 4

124. The refrigerant used in domestic refrigerator is
(1) R134a (2) R600 (3) R1234yf (4) All of the above

125. Potato is stored in cold storages at _____ temperature.
(1) 14°C (2) – 20°C
(3) –10°C (4) None of the above

126. Specific humidity is the ratio of mass of water vapour to
(1) mass of dry air (2) mass of dry and moist air
(3) mass of dry air in a saturated air (4) None of the above

127. Psychrometric chart is drawn with _____.
(1) DBT on x-axis and specific humidity on y-axis
(2) DBT on y-axis and specific humidity on x-axis
(3) DBT on x-axis and RH on y-axis
(4) None of the above

128. Sensible Heat Factor (SHF) is the ratio of
(1) Sensible heat to total heat (2) Total heat to sensible heat
(3) Sensible heat to latent heat (4) None of the above

129. People feel comfortable for DBT at _____ and _____ RH.
(1) 22°C, 50% (2) 30°C, 60%
(3) 26°C, 45% (4) None of the above

130. The domestic refrigerator gives the best performance in _____.
(1) Summer season (2) Winter season
(3) Rainy season (4) All of the above

131. When production is 'make to stock' or mass production, suitable layout is

(1) Process layout

(2) Product layout

(3) Fixed layout

(4) Group layout

---

132. The advantage of product layout is

(1) Line output is decided by bottleneck machine.

(2) Minimum material handling cost.

(3) Change in product may not require the facility modification.

(4) Machines are not shared by different products.

---

133. _____ is concerned with successfully transforming the design into a physical product.

(1) Process Engineering

(2) Material Requirement Planning

(3) Capacity Requirement Planning

(4) None of the above

---

134. Machine output is _____ proportional to the cycle time.

(1) directly

(2) indirectly

(3) inversely

(4) None of the above

---

135. _____ is the application of techniques designed to establish the time for a qualified worker to carry out a specific job at a defined level of performance.

(1) Value analysis

(2) Time study

(3) Work measurement

(4) Method study

---

136. The quality of the product means

(1) Degree of brightness

(2) Fitness for use

(3) Degree of perfection at any cost

(4) Fitness for use at minimum cost

---

137. _____ is determining the degree of closeness of the relationship between variables.

(1) Regression analysis (2) Correlation analysis

(3) Exponential smoothing method (4) Least square method

---

138. _____ is the maximum percent defective that, for the purpose of sampling inspection, can be considered as a process average.

(1) AQL (2) AOQL

(3) LTPD (4) ABC

---

139. Basic shafts have upper deviation

(1) Positive (2) Negative

(3) Zero (4) All of the above

---

140. For clearance fit between shaft and bearing

(1) Lower limit on the hole should be greater than upper limit on the shaft.

(2) Lower limit on the hole should be smaller than upper limit on the shaft.

(3) Upper limit on the hole should be smaller than lower limit on the shaft.

(4) Lower limit on the hole should be smaller than lower limit on the shaft.

---

141. The pressure head due to acceleration in the suction pipe (has) of reciprocating pump is given by

where,

A = Area of pump

ω = Angular velocity

a = Area of pipe

L = Length of pipe

and subscript 's' stands for suction.

(1) $\frac{L_s}{g} \times \frac{A}{a_s} \times \omega_r \cos\theta$

(2) $\frac{L_s}{2g} \times \frac{A^2}{a_s} \times \omega_r \cos\theta$

(3) $\frac{L_s}{2g} \times \frac{A}{a_s} \times \omega_r^2 \cos\theta$

(4) None of the above

---

142. Head developed by a centrifugal pump depends on

(1) Impeller diameter and speed

(2) Fluid density

(3) Type of casing

(4) All of the above

---

143. Axial flow pump is started with its delivery valve

(1) kept fully closed (2) kept fully open

(3) irrespective of any position (4) None of the above

---

144. Multistage centrifugal pumps are used to obtain

(1) High discharge (2) High head

(3) High head and high discharge (4) High efficiency

---

145. A valve, when in centre position directs the pump flow to reservoir port with the other two working ports closed. This is known as _____.

(1) Open centre position

(2) Closed centre position

(3) Tandem centre position

(4) Five-way three-position valve

---

146. Specific speed of a turbine is indicated as

(1) $\frac{N\sqrt{Q}}{H^{3/4}}$ (2) $\frac{N\sqrt{P}}{H^{5/4}}$

(3) $\frac{N\sqrt{P}}{H^{3/4}}$ (4) $\frac{N\sqrt{P}}{H^{3/2}}$

---

147. Power required to drive a centrifugal pump is proportional to

(1) Speed, N (2) N^2

(3) N^3 (4) $1/N^2$

---

148. In Kaplan turbine runner, the number of blades is generally of the order

(1) 4 – 8 (2) 8 – 16

(3) 16 – 24 (4) 24 – 32

---

149. Saving of work done and power by fitting an air vessel to a single acting reciprocating pump is of the order of

(1) 49·2% (2) 68·8%

(3) 84·8% (4) 91·6%

---

150. The angle of taper on the draft tube is

(1) less than 3°

(2) less than 8°

(3) greater than 15°

(4) greater than 8°

विभाग 'क'

151. High performance sports car with active exhaust system allows _____.

(1) larger flow area, reduces the restriction in the exhaust system

(2) to maintain the flow area without affecting the restriction in the exhaust system

(3) smaller flow area, reduces the restriction in the exhaust system

(4) None of the above

---

152. If the fuel consumption of 4-stroke IC engine is 0·1 kg/min and calorific value of fuel used is 40,000 kJ/kg, then the amount of energy supplied per minute is _____.

(1) 66·67 kJ (2) 666·7 kJ

(3) 4,000 kJ (4) 400 kJ

---

153. The number of amperes that the battery can deliver for 30 seconds at –18°C without cell voltage falling below 7·2 volts is called the _____.

(1) Charging rate (2) Reserve capacity

(3) Cold-cranking rate (4) Ampere-hour rate

---

154. Disk brakes self-adjust when lining wear allows the piston to _____.

(1) Slide outward of the seal and take new position closer to the disc

(2) Slide inward of the seal and take new position closer to the disc

(3) Slide both sides of the seal and take new position closer to the disc

(4) None of the above

---

155. For tightening cylinder head bolts, it is preferable to use _____.

(1) Open-ended spanner

(2) Torque wrench

(3) Ring spanner

(4) Adjustable spanner

---

156. Purging of the charcoal canister occurs when

(1) air flow from the fuel tank flows through the canister.

(2) air flows from the float bowls through the canister.

(3) air flows through the canister on its way to the intake manifold.

(4) air flows through the canister on its way to the exhaust manifold.

---

157. The radial tyre provides better fuel economy than a bias ply tyre because _____.

(1) Radial tyre has less rolling resistance

(2) Bias ply tyre has less rolling resistance

(3) Radial tyre has more rolling resistance

(4) Bias ply tyre has more rolling resistance

---

158. Removing the glaze from cylinder walls before installing new piston rings helps avoid _____.

(1) quick seating of the piston rings

(2) engine overheating

(3) excessive friction

(4) slow seating of the piston rings

---

159. The brake specific fuel consumption is expressed as the fuel consumed _____.

(1) per unit time

(2) per hour per unit brake horsepower

(3) per km distance covered

(4) per hour per unit indicated horsepower

---

160. Why are the pistons usually given a coating (e.g. tin coating) ?

(1) To increase lubrication effect

(2) To conduct heat efficiently

(3) To reduce weight

(4) To reduce possibility of scoring

---

161. As per the Motor Vehicles Act, 1988, a person engaged in collecting fares from passengers, regulating their entrance into or exit from the stage carriage and performing such other functions is called

(1) Driver (2) Conductor

(3) Labour (4) None of the above

---

162. Nishu, a teenager, has attained 16 years of age. According to the Motor Vehicles Act, 1988, he is permitted to drive a 2-wheeler named as

(1) Honda of Japan (2) TVS Champ 60

(3) Atlas-Honda of Pakistan (4) Hero-Honda of India

---

163. A Chevrolet Impala car bears registration number BY 4097. In which State is this car registered and what is the likely year of its registration ?

(1) Bihar, around 1979 – 89

(2) Andaman and Nicobar Islands, after 1990

(3) Maharashtra, before 01-10-1961

(4) None of the above

---

164. The traffic sign of "cross roads" is shown on a roadside. Its indication to the driver is to

(1) slow down and proceed cautiously.

(2) stop.

(3) keep special vigil on the traffic.

(4) drive at 20 kmph.

---

165. A road has no provision of pedestrian movement on its parallel side. While moving on it, safety demands that the pedestrians movement should be

(1) on right side of the road, i.e., facing the incoming traffic.

(2) on left side of the road, i.e., along the traffic.

(3) in the middle of the road.

(4) None of the above

---

166. _____ means a motor vehicle specially designed and constructed, and not merely adapted, for the use of a person suffering from some physical defect or disability, and used solely by or for such a person.

(1) Invalid carriage

(2) Articulated vehicle

(3) Tractor

(4) None of the above

---

167. "Heavy Passenger Motor Vehicle" means any public service vehicle or private service vehicle or educational institution bus or omnibus, the gross vehicle weight of any of which, or a motor car, the unladen weight of which exceeds

(1) 15,000 kg (2) 12,000 kg

(3) 10,000 kg (4) 8,000 kg

---

168. No person shall be granted a conductors license unless he has passed

(1) Secondary School Certificate exam or an equivalent or higher exam.

(2) XIth exam or an equivalent exam.

(3) VIIIth exam.

(4) VIIth exam.

---

169. A temporary certificate of registration is valid for a period not exceeding

(1) One month (2) One year

(3) Two years (4) Six months

---

170. The Bombay Motor Vehicles Tax Act, 1958 became effective from

(1) 01-01-1958 (2) 01-04-1958

(3) 01-07-1958 (4) 31-12-1957

---

171. If a force of 10 units is applied to the master cylinder of an automotive brake system which uses wheel cylinder piston of 5 square units surface area, then the output force at wheels will be

(1) 10 units
(2) 15 units
(3) 50 units
(4) Cannot be estimated

172. The problem of a gradual torque take-up when the vehicle is moving away from a standstill has been overcome with

(1) the introduction of fluid coupling between engine and gear box.
(2) the introduction of epicyclic gear box between engine and final drive.
(3) the introduction of torque converter between engine and transmission gears.
(4) None of the above

173. The advantages of using helical gears rather than spur gears in a transmission system are _____ .

(1) High strength and low cost
(2) High strength and less end thrust
(3) High strength and low noise level
(4) Low noise level and economical

174. Engine torque fluctuations in a typical single plate clutch are absorbed by _____.

(1) pressure plate
(2) cushion springs
(3) torsional springs
(4) pressure springs

175. Coupling efficiency is the ratio of the

(1) power available at the turbine to the amount of power supplied to the impeller.
(2) power available at the impeller to the amount of power supplied to the stator.
(3) power available at the impeller to the amount of power supplied to the turbine.
(4) None of the above

176. Fading of brakes occurs _____.

(1) at high speed

(2) at low speed

(3) during continuous application

(4) when brake lining is worn out

---

177. Automotive damper works on the principle of _____.

(1) metallic friction

(2) viscous damping

(3) fluid gravity

(4) electromagnetic induction

---

178. The frame may get distorted to a parallelogram shape due to _____.

(1) weight of vehicle

(2) weight of the passengers

(3) cornering force

(4) wheel impact with road obstacles to one side of vehicle

---

179. When two rubber blocks are inclined to each other to a 'V' mounting, the rubber will be loaded in _____.

(1) only compression force

(2) both compression and shear forces

(3) only shear force

(4) None of the above

---

180. The ratio of angle turned by steering wheel to corresponding turning angle of the stub axle is called as _____.

(1) steering ratio

(2) movement ratio

(3) slip angle ratio

(4) thrust angle ratio

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

Q.No. 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.**

कच्च्या कामासाठी जागा/SPACE FOR ROUGH WORK