A

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प्रश्नपुस्तिका क्रमांक
BOOKLET No.

प्रश्नपुस्तिका

यंत्र अभियांत्रिकी स्वयंचल अभियांत्रिकी/
यंत्र अभियांत्रिकी/स्वयंचल अभियांत्रिकी

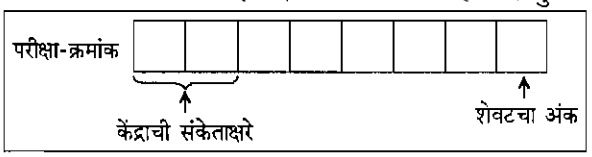
वेळ : $1\frac{1}{2}$ (दीड) तास

एकूण प्रश्न : 150
एकूण गुण : 300

सूचना

(1) उमेदवारांनी अेकूण 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.

(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', '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.

पर्यवेक्षकांच्या सूचनेविना हे सील उघडू नये

पुढील सूचना प्रश्नपुस्तिकेच्या अंतिम पृष्ठावर पहा

विभाग अ (PART A) MECHANICAL ENGINEERING – AUTOMOBILE ENGINEERING

1. The strain energy stored in a body, when suddenly loaded, is _____ the strain energy stored when load is applied gradually.
   (1) equal to (2) 1/2
   (3) twice (4) 4 times

2. The design of a thin cylinder shell is based on
   (1) hoop stress
   (2) arithmetic mean of the hoop and longitudinal stress
   (3) geometric mean of the hoop and longitudinal stress
   (4) longitudinal stress

3. The bending moment on a section is maximum where shear force is
   (1) minimum (2) maximum
   (3) changing sign (4) zero

4. When a bar is subjected to a change of temperature and its deformation is prevented, the stress induced in the bar is
   (1) tensile stress (2) compressive stress
   (3) shear stress (4) thermal stress

5. Hooke's law holds good up to
   (1) Yield point (2) Elastic limit
   (3) Plastic limit (4) Breaking point

6. The Poisson's ratio for steel varies from
   (1) 0·23 to 0·27 (2) 0·25 to 0·33
   (3) 0·31 to 0·34 (4) 0·32 to 0·42

7. The point of contraflexure is a point where
   (1) shear force changes sign (2) bending moment changes sign
   (3) shear force is maximum (4) bending moment is maximum

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8. Factor of safety is defined as the ratio of
   (1) ultimate stress to working stress
   (2) working stress to ultimate stress
   (3) breaking stress to ultimate stress
   (4) ultimate stress to breaking stress

9. The plane of maximum shear stress has normal stress that is
   (1) maximum (2) minimum
   (3) zero (4) None of the above

10. Bending moment M and torque T is applied on a solid circular shaft. If the maximum bending stress equals to maximum shear stress developed, then M is equal to
   (1) T/2 (2) T (3) 2T (4) 4T

11. The slope at the free end of a cantilever carrying a 'UDL', W N/m over a span L is
   (1) $\frac{WL^2}{24\,EI}$ (2) $\frac{WL^2}{48\,EI}$ (3) $\frac{WL^4}{8\,EI}$ (4) $\frac{WL^3}{6\,EI}$

12. In short column failure occurs by
   (1) Pure buckling
   (2) Combination of bending and direct compression
   (3) Direct compression only
   (4) None of the above

13. The diameter of the core circular column of diameter 'd' under any load shall be
   (1) d/8 (2) d/6 (3) d/4 (4) d/2

14. A sudden change in shear force diagram between any two points indicates that there is
   (1) Point load at both the points
   (2) No loading between two points
   (3) UDL between two points
   (4) Uniformly varying load between two points

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15. Principal planes are planes having

(1) Maximum shear stress (2) No shear stress

(3) Minimum shear stress (4) None of the above

16. Position feedback device on NC Machine is

(1) Shaft encoder (2) Linear scales

(3) Inductosyn (4) Any of the above

17. The surface finish obtainable in ultrasonic machining is of the order of

(1) 0·2 to 0·5 μm CLA (2) 2 to 5 μm CLA

(3) 20 to 50 μm CLA (4) 200 to 500 μm CLA

18. In metal cutting operation, shear angle is defined as the angle

(1) made by the plane of shear with the direction of tool travel

(2) made by shear plane with the tool axis

(3) made by shear plane with central plane of workpiece

(4) None of the above

19. While grinding, the increase in wheel speed, with constant-feed rate, results in

(1) shining surface (2) abrasive mark on workpiece

(3) reduction of chip size (4) glazing of wheel

20. In orthogonal cutting of metals, cutting edge is

(1) perpendicular to the direction of tool travel

(2) perpendicular to workpiece

(3) perpendicular to shear plane

(4) perpendicular to the axis of cutting tool

21. Vanadium is added to steel as an alloying element to

(1) increase temperature resistance

(2) increase shock resistance

(3) modify yield and tensile strength properties

(4) soften the material

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P.T.O.

22. The relative spacing of abrasive grains in a grinding wheel is referred to as _____ of the wheel.

(1) dressing (2) truing

(3) turning (4) shaping

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23. In _____ system, all the measurements are taken from a single reference point.

(1) Open loop (2) Closed loop

(3) Absolute (4) Incremental

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24. Which factor decides the selection of grinding wheel ?

(1) Abrasive (2) Grain size

(3) Grade (4) Structure

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25. Depth of cut of drill of diameter D is

(1) D (2) D/2

(3) 1·5 D (4) 1·2 D

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26. Gear finishing operation is called as

(1) Shaping (2) Milling

(3) Hobbing (4) Burnishing

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27. The drill spindles are provided with standard taper known as

(1) Morse taper (2) Seller's taper

(3) Chamfer taper (4) Brown taper

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28. Nodular cast iron is produced by adding _____ to the molten cast iron.

(1) nickel (2) chromium

(3) copper (4) magnesium

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29. In a basic NC machine, programmed instructions are stored in

(1) Punched tape (2) Graphic terminal

(3) Head box (4) None of the above

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30. The binding material used in cemented carbide tool is

(1) tungsten (2) chromium

(3) silicon (4) cobalt

31. In electro-discharge machining, dielectric is used to

(1) help in the movement of the sparks

(2) control the spark discharges

(3) act as coolant

(4) All of the above

32. Internal gears can be made by

(1) hobbing (2) shaping with pinion cutter

(3) shaping with rack cutter (4) milling

33. In drilling operation, the metal is removed by

(1) shearing (2) extrusion

(3) shearing and extrusion (4) shearing and compression

34. The type of tool used on milling machine and broaching machine is

(1) single point cutting tool (2) two point cutting tool

(3) three point cutting tool (4) multi-point cutting tool

35. Discontinuous chips are formed during machining of

(1) brittle metals (2) ductile metals

(3) hard metals (4) soft metals

36. The lead screw of a lathe with nut forms a

(1) rolling pair (2) sliding pair

(3) screw pair (4) turning pair

37. The periodic time of one oscillation for a simple pendulum is

(1) $2\pi\sqrt{\frac{g}{l}}$ (2) $\frac{1}{2\pi}\sqrt{\frac{g}{l}}$ (3) $2\pi\sqrt{\frac{l}{g}}$ (4) $\frac{1}{2\pi}\sqrt{\frac{l}{g}}$

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38. The power from the engine to the rear axle of an automobile is transmitted by m of

(1) Worm and worm wheel (2) Spur gears

(3) Compound gears (4) Hooke's joint

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39. The gears are termed as medium velocity gears, if their peripheral velocity is

(1) 1 – 3 m/s (2) 3 – 15 m/s

(3) 15 – 30 m/s (4) 30 – 50 m/s

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40. The gear train usually employed in clocks is a

(1) simple gear train (2) reverted gear train

(3) sun and planet gear (4) differential gear

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41. The size of cam depends upon

(1) Base circle (2) Pitch circle

(3) Prime circle (4) Pitch curve

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42. The velocity of the belt for maximum power is

(1) $\frac{T}{3}$ (2) $\frac{Tg}{3}$ (3) $\sqrt{\frac{T}{3m}}$ (4) $\sqrt{\frac{3m}{T}}$

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43. Vee-belt E-type cross-sections are generally used in

(1) Automobiles

(2) Small Engines

(3) When driver and driven units are far off

(4) Heavy duty machine

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44. For a machine to be self sustaining, the relation between ϕ = angle of friction and α = slope of threads, is

(1) $\alpha = \phi$ (2) $\alpha < \phi$

(3) $\alpha > \phi$ (4) $\frac{\alpha}{\phi}$ = constant

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45. Cylindrical type cam is one

(1) with cylindrical roller follower

(2) with cylindrical shape of follower

(3) with circumferential contour cut in surface of cylinder which rotates about its axis

(4) with circular type of motion of follower

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46. Dynamics of machine deals with

(1) the relative motion between the parts neglecting the consideration of forces

(2) the forces acting on the parts of the machines

(3) the apparatus for applying mechanical power

(4) the number of inter-related parts, each having a definite motion

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47. A disc is spinning with angular velocity ω rad/sec about the axis of spin. The couple applied to the disc causing precision will be :
where ω_p = angular velocity of precision of axis of spin and
I = mass momentum inertia of disc.

(1) $\frac{1}{2} I \omega^2$ (2) $I \omega^2$

(3) $\frac{1}{2} I \omega \omega_p$ (4) $I \omega \omega_p$

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48. A Pentagraph is a mechanism or kinematic arrangement comprising

(1) a lower pair (2) two lower pairs

(3) three lower pairs (4) 10 links

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49. The maximum efficiency of screw jack is ($\mu = \tan \phi$)

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

(3) $\frac{1 - \tan\phi}{1 + \tan\phi}$ (4) $\frac{1 + \tan\phi}{1 - \tan\phi}$

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50. A differential gear in an automobile is a

(1) simple gear train (2) epicyclic gear train

(3) compound gear train (4) None of the above

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51. A Hartnell governor is a

(1) pendulum type (2) spring loaded type

(3) dead weight type (4) inertia type

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52. When the two pulleys of different diameters are connected by means of open belt drive, then the angle of contact taken into consideration should be of the

(1) larger pulley (2) smaller pulley

(3) average of two pulleys (4) None of the above

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53. A fixed gear having 200 teeth is in mesh with another gear having 50 teeth. The two gears are connected by arms. The number of turns made by the smaller gear for one revolution of arm about the center of the bigger gear is

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

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54. The relation between number of pairs (p) forming a kinematic chain and the number of links (l) is

(1) $l = 2p - 2$ (2) $l = 2p - 3$

(3) $l = 2p - 4$ (4) $l = 2p - 5$

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55. The component of the acceleration, perpendicular to the velocity of the particle, at the given instant is called

(1) Radial component (2) Tangential component

(3) Coriolis component (4) None of the above

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56. In a capillary tube, the weight of the liquid raised is supported by

(1) friction of tube (2) vertical component of surface tension

(3) atmospheric pressure (4) vapour pressure

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57. The pressure head of fluid is the ratio of intensity of pressure to

(1) specific weight (2) specific gravity

(3) fluid height (4) density

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58. Velocity potential function when equated to a series of constants yields the equ of

(1) stream lines (2) path lines

(3) equipotential lines (4) u and v

59. The differential equation of fluid in a curved path relates the pressure gradient in radial direction and

(1) normal acceleration (2) tangential acceleration

(3) level differences in liquid surface (4) angular momentum

60. One poise is equivalent to

(1) 360 kg/m-hr (2) 1 dyne sec/cm^2

(3) $\frac{1}{9{\cdot}81}$ kgf . sec/m^2 (4) All of the above

61. The boundary layer thickness in turbulent flow varies as

(1) $x^{2/3}$ (2) $x^{4/5}$ (3) $x^{1/7}$ (4) $x^{3/7}$

62. The rate of flow through a venturimeter varies as

(1) $\sqrt{H}$ (2) H (3) $H^{3/2}$ (4) H^2

63. Pascal's law states that pressure at a point is equal in all directions

(1) in a liquid at rest (2) in a fluid at rest

(3) in a laminar flow (4) in a turbulent flow

64. The difference in pressure head measured by a mercury water differential manometer for a 20 cm difference of mercury level will be

(1) 2·72 m (2) 2·52 m (3) 2·0 m (4) 0·2 m

65. A flow through an expanding tube at constant rate is called

(1) steady uniform flow (2) unsteady uniform flow

(3) steady non-uniform flow (4) unsteady non-uniform flow

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66. Atmospheric pressure held in terms of water column is

(1) 7·5 m (2) 8·5 m (3) 9·81 m (4) 10·3 m

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67. The coefficient of friction for laminar flow through a circular pipe is given by

(1) $F = \frac{0{\cdot}0791}{Re^{1/4}}$ (2) $\frac{16}{Re} = F$

(3) $F = \frac{64}{Re}$ (4) $F = \frac{12}{Re}$

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68. The capillary rise or fall of a liquid is given by

(1) $h = \frac{\sigma \cos\theta}{4\rho g d}$ (2) $h = \frac{2\sigma \cos\theta}{\rho g d}$

(3) $h = \frac{8\sigma \cos\theta}{\rho g d}$ (4) $h = \frac{9\sigma \cos\theta}{\rho g d}$

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69. A hot wire anemometer is a device used for measuring

(1) viscosity (2) velocity of gas

(3) pressure of gases (4) velocity of liquid

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70. Bulk modulus of elasticity

(1) is independent of temperature

(2) increases with pressure

(3) is independent of pressure and viscosity

(4) is larger when fluid is more compressible

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71. The viscosity of water at 20°C is

(1) 1/10 poise (2) 1/100 poise

(3) 1 poise (4) None of the above

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72. Predict the pressure in kPa at an elevation of 2000 m in an isothermal atmosphere, assuming T = 20°C and P_{atm} = 100 kPa.

(1) 87 (2) 82 (3) 79 (4) 71

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73. Due to variation of venturimeter constant, venturimeters are not suitable for

(1) Low velocity (2) High velocity

(3) Low pressure (4) High pressure

74. Steady flow occurs when

(1) Pressure does not change along flow

(2) Velocity does not change

(3) Conditions change gradually with time

(4) Conditions do not change with time at any time

75. In turbulent flow in a pipe, we know the

(1) Reynolds number is greater than 10,000

(2) fluid particles move in straight line

(3) head loss varies linearly with flow rate

(4) shear stress varies linearly with radius

76. Kelvin-Planck's law deals with

(1) Conservation of work (2) Conservation of heat

(3) Conservation of mass (4) Conversion of heat into work

77. A cycle consisting of two constant volumes and two isothermal processes is known as

(1) Carnot cycle (2) Joule cycle

(3) Diesel cycle (4) Stirling cycle

78. One reversible heat engine operates between 1600 K and T_2 K and another reversible heat engine operates between T_2 K and 400 K. If both the engines have same thermal efficiency, the temperature T_2 is,

(1) 800 K (2) 1000 K (3) 1200 K (4) 1400 K

79. The absolute zero temperature is

(1) – 273°C (2) 273°C (3) 237°C (4) – 237°C

SPACE FOR ROUGH WORK

80. If the flow of air through the compressor is perpendicular to its axis, then it

(1) reciprocating compressor (2) centrifugal compressor

(3) axial flow compressor (4) turbo compressor

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81. Energy resources derived from natural organic materials are called

(1) geothermal energy (2) fossil fuels

(3) biomass (4) All of the above

---

82. Energy available in fuels is stored as

(1) heat energy (2) chemical energy

(3) atomic energy (4) explosive energy

---

83. Brayton cycle process is

(1) Two isentropic and two constant volumes

(2) Two isentropic and two constant pressures

(3) One constant pressure, one constant volume, two adiabatics

(4) Two isothermals and constant volume and constant pressure

---

84. Which one of the following is a heterogeneous system ?

(1) The cooling fluid in a radiator (2) Atmospheric air

(3) Cooking gas in a cylinder (4) A mixture of ice, water and steam

---

85. Thermal efficiency of gas turbine cycle improves as a result of all of the following *except*

(1) Heating of air before compression (2) Inter-cooling of air

(3) Reheating of gas (4) Multi-stage expansion

---

86. In gas turbine, compressor used is

(1) Reciprocating type (2) Centrifugal type

(3) Axial flow type (4) Lobe type

SPACE FOR ROUGH WORK

87. The entropy may be expressed as a function of

(1) Pressure and temperature (2) Volume and pressure

(3) Heat and work (4) All of the above

88. Maxwell's thermodynamic relations are valid for

(1) Closed system only

(2) All processes of thermodynamics

(3) Only reversible process

(4) A thermodynamic system in equilibrium

89. Which one of the following introduces irreversibility in the actual Carnot engine operation ?

(1) Friction between moving parts

(2) Higher operating speed

(3) Lower operating speed

(4) Changes in pressure and temperature during cycle

90. The universal gas constant of a gas is the product of molecular weight of the gas and

(1) gas constant (2) specific heat at constant pressure

(3) specific heat at constant volume (4) None of the above

91. In a throttling process

(1) $W = 0$ (2) $E = 0$

(3) $\Delta H = 0$ (4) All of the above

92. With decrease in cut-off, the efficiency of diesel cycle

(1) increases (2) decreases

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

SPACE FOR ROUGH WORK

93. For reciprocating air compressor, the law of compression desired is isotherm that may be possible at

(1) very low speeds

(2) very high speeds

(3) any speed as speed does not affect the compression law

(4) None of the above

---

94. Mean effective pressure at a given compression ratio is maximum when the air-fuel ratio is

(1) higher than stoichiometric (2) lower than stoichiometric

(3) equal to stoichiometric (4) None of the above

---

95. In the Orsat apparatus, KOH solution is used to absorb

(1) Carbon monoxide (2) Carbon dioxide

(3) Oxygen (4) None of the above

---

96. The radiator tubes are manufactured by using

(1) cast iron (2) aluminium

(3) brass (4) steel

---

97. The brake shoes are curved to conform to the inner diameter of the

(1) tyre (2) wheel

(3) pedal (4) brake drum

---

98. A liquid that boils at a relatively high temperature is said to have

(1) a low viscosity (2) a high viscosity

(3) a high volatility (4) a low volatility

---

99. Gudgeon pins are made of

(1) cast iron (2) hardened and ground steel

(3) piston material itself (4) cork

SPACE FOR ROUGH WORK

100. The ease with which a liquid changes to vapour is called its

(1) Vapourability (2) Volatility

(3) Boiling point (4) Viscosity

---

101. The mean effective pressure of diesel cycle having fixed compression ratio will increase if cut-off ratio

(1) Increases (2) Decreases

(3) Independent of CR (4) Depends upon other factors

---

102. In a SI engine, advancing of spark timing will

(1) Increase knocking tendency

(2) Reduce knocking tendency

(3) Not have any effect on knocking

(4) Depend on intensity of spark only

---

103. In a CI engine, squish is created

(1) towards the end of compression stroke

(2) at the end of suction stroke

(3) at the beginning of suction stroke

(4) during the combustion

---

104. More CO is generally formed when

(1) mixture is rich in fuel (2) mixture is lean in fuel

(3) dust is present in fuel (4) engine is 4 stroke

---

105. What will happen if petrol is used in diesel engine ?

(1) Black smoke will be produced

(2) Low power will be produced

(3) Higher knocking will occur

(4) The engine will not run

---

106. Stoichiometric air-fuel ratio by mass for combustion of petrol is

(1) 5 : 1 (2) 10 : 1 (3) 12 : 1 (4) 15 : 1

SPACE FOR ROUGH WORK

107. For petrol engines, the method of governing employed is

(1) quantity governing (2) quality governing

(3) hit and miss governing (4) None of the above

---

108. Which of the following components is absent in C.I. engine ?

(1) Carburettor (2) Piston Rings

(3) Water Jackets (4) Fuel Injector

---

109. The main purpose of a thermostat in an engine cooling system is to

(1) allow engine to warm-up quickly

(2) prevent the coolant from boiling

(3) pressurize the system

(4) indicate to the driver the coolant temperature

---

110. Turbocharger engines are those in which charge density is increased by

(1) Separate air compressors

(2) Compressors driven by exhaust gas turbine

(3) Cooling inlet air

(4) None of the above

---

111. In any atom the number of electrons in the last orbit (valence orbit) is limited to

(1) 12 (2) 10

(3) 8 (4) 4

---

112. Which interrupt has highest priority ?

(1) INTR (2) TRAP

(3) RST 7·5 (4) RST 6·5

---

113. An unijunction transistor (UJT) has

(1) 2 p-n junctions and 2 leads (2) 1 p-n junction and 3 leads

(3) 4 p-n junctions (4) 4 leads

SPACE FOR ROUGH WORK

114. A certain Zener diode exhibits a 50 mV change in V_Z for a 2·5 mA change in I_Z. What is the Zener resistance ?

(1) 12·5 Ω (2) 20 Ω

(3) 307·5 Ω (4) None of the above

---

115. The bandwidth of an ideal op-amp is

(1) 0 to ∞ operating frequency range

(2) 0 to 1 operating frequency range

(3) 0 to 100 operating frequency range

(4) None of the above

---

116. The characteristics of op-amp do ***not*** change

(1) with temperature only

(2) with change in current only

(3) with change in voltage only

(4) with temperature, current and voltage

---

117. DC forward voltage is needed to emit light in case of

(1) LED (2) LCD

(3) Both LED and LCD (4) Neither LED nor LCD

---

118. Which logic gate is similar to the function of two parallel switches ?

(1) AND (2) NAND (3) OR (4) NOR

---

119. The critical depth meter is used to measure

(1) velocity of flow in an open channel

(2) depth of flow in an open channel

(3) hydraulic jump

(4) depth of channel

---

120. The piston compression rings are made of

(1) cast iron (2) steel (3) aluminium (4) bronze

SPACE FOR ROUGH WORK

विभाग ब (PART B) MECHANICAL ENGINEERING

121. The efficiency of a free jet striking normally on a series of flat plates mounted on the periphery of a wheel never exceeds

(1) 40% (2) 50% (3) 60% (4) 70%

122. A jet of water 75 mm diameter having a velocity of 20 m/s strikes normally a flat smooth plate. Determine the thrust on the plate, if the plate is at rest.

(1) 1500 N (2) 1668 N (3) 1700 N (4) 1768 N

123. Jet pumps are often used in process industry for their

(1) high efficiency (2) easy maintenance
(3) large capacity (4) None of the above

124. An impulse turbine

(1) is always operated submerged
(2) makes use of draft tube
(3) is most suited for low head installation
(4) operates by initial complete conversion to kinetic energy

125. A double acting reciprocating pump with 50 rpm speed and piston having 400 mm stroke length and 0·03 m^2 cross-sectional area will have theoretical fluid flow of

(1) 0·01 m^3/s (2) 0·02 m^3/s (3) 0·6 m^3/s (4) 10 m^3/s

126. A jet of water issues from a nozzle with a velocity of 20 m/sec and it impinges normally on a flat plate moving away from it at 10 m/sec. If cross-sectional area of jet is 0·02 m^2 and density of water is 1000 kg/m^3, then force developed on the plate is

(1) 10 N (2) 100 N (3) 1000 N (4) 2000 N

127. A fast centrifugal pump impeller will have

(1) forward facing blades (2) radial blades
(3) backward facing blades (4) propeller type blades

128. For small discharge at high pressure, pump preferred is

(1) centrifugal (2) axial flow
(3) propeller (4) reciprocating

SPACE FOR ROUGH WORK

129. The ratio of power given to the fluid by the pump to the shaft power is called

(1) manometric efficiency (2) hydraulic efficiency

(3) overall efficiency (4) mechanical efficiency

---

130. The circuit in which hydraulic motor is located after the speed control valve is

(1) metered circuit (2) meter-in circuit

(3) meter-out circuit (4) bleed-off circuit

---

131. In actual practice, one tonne of refrigeration is equivalent to

(1) 3·0 kW (2) 3·5 kW (3) 4·0 kW (4) 4·5 kW

---

132. Environmental protection agencies advise against the use of chloro-fluoro-carbon refrigerants since they react with

(1) water vapour and cause acid rain

(2) plants and cause green house effect

(3) oxygen and cause depletion

(4) ozone layer

---

133. A machine working on a Carnot cycle operates between 305 K and 260 K. Determine the C.O.P. when it is operated as a refrigerating machine.

(1) 5·78 (2) 6·78

(3) 0·147 (4) None of the above

---

134. In vapour compression system, the highest temperature of the refrigerant during the cycle occurs after

(1) evaporation (2) compression (3) condensation (4) expansion

---

135. In aqua-ammonia and Li-Br water absorption refrigeration system, the refrigerants are respectively

(1) water and water (2) water and Li-Br

(3) ammonia and Li-Br (4) ammonia and water

---

136. In pressure enthalpy chart, space to the right of saturated liquid line represents

(1) sub-cooling liquid region

(2) superheated vapour region

(3) wet vapour region

(4) None of the above

SPACE FOR ROUGH WORK

P.T.O.

137. During humidification process, dry bulb temperature

(1) increases (2) decreases

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

---

138. For summer air-conditioning, the relative humidity should ***not*** be less than

(1) 40% (2) 60% (3) 75% (4) 90%

---

139. The temperature of air recorded by thermometer, when it is not affected by the moisture present in it, is called

(1) Wet bulb temperature (2) Dry bulb temperature

(3) Dew point temperature (4) None of the above

---

140. In cooling towers, the heat is dissipated mainly by

(1) Convection (2) Conduction

(3) Radiation (4) Evaporation

---

141. Process type of plant layout is suitable in

(1) Batch and Mass production (2) Jobshop and Mass production

(3) Jobshop and Batch production (4) None of the above

---

142. Tolerances are specified

(1) to obtain desired fits

(2) because it is not possible to manufacture in size exactly

(3) to obtain high accuracy

(4) to have proper allowance

---

143. A decision making process to determine when a job is to be started in a machine and when it is to be completed is

(1) Scheduling (2) Routing

(3) Master scheduling (4) Aggregate planning

SPACE FOR ROUGH WORK

144. The order in which different jobs are being taken up in a machine or process is called

(1) Scheduling (2) Sequencing

(3) Routing (4) Aggregate planning

---

145. Optical flats are made of

(1) quartz (2) glass (3) plastic (4) steel

---

146. Object of time study is to determine the time taken by

(1) expert worker (2) new employee

(3) apprentice (4) average worker

---

147. Most important characteristic of measuring instrument, in general, is

(1) Precision (2) Accuracy

(3) Reputability (4) Sensitivity

---

148. The least count of a metric vernier calliper having 25 divisions on vernier scale matching with 24 divisions of scale (1 main scale division = 0·5 mm) is

(1) 0·005 mm (2) 0·01 mm (3) 0·02 mm (4) 0·05 mm

---

149. The thread micrometer measures

(1) major diameter of the thread

(2) minor diameter of the thread

(3) effective diameter of the thread

(4) root diameter of the thread

---

150. Gantt charts are used for

(1) Time study (2) Production schedule

(3) Motion study (4) None of the above

SPACE FOR ROUGH WORK

विभाग क (PART C) AUTOMOBILE ENGINEERING

151. The load carrying capacity of a tyre refers to

(1) Aspect ratio (2) Ply rating and its size

(3) Type of rubber (4) Tyre pressure

---

152. The purpose of torque convertor in automobile is

(1) Automatically multiplying engine torque

(2) Automatically multiplying engine speed

(3) Automatically control the speed of engine

(4) Automatically multiplying vehicle torque

---

153. X-member of a car frame ensures improved

(1) bending strength of side members

(2) resistance to vertical shock loads acting simultaneously on both front wheels

(3) resistance to side force due to transverse wind load

(4) resistance of wearing and torsional strength of front end of frame

---

154. In the integral type of power brake, the diaphragm acts directly on the hydraulic piston in the

(1) master cylinder (2) wheel cylinder

(3) multiplier unit (4) None of the above

---

155. In the transmission, the reverse idler gear always meshes with

(1) counter shaft drive gear (2) counter shaft low gear

(3) main shaft reverse gear (4) counter shaft reverse gear

---

156. Slip joint in automotive driveline is used for

(1) accommodating change in length of driveshaft

(2) connecting the driveshaft to gear box

(3) damping the vibrations of drive train

(4) transmitting the torque

---

157. The crumple zones of automotive body

(1) reduce the production cost

(2) increase aesthetic appeal of a vehicle

(3) absorb shock during collision

(4) reduce interior noise in a vehicle

SPACE FOR ROUGH WORK

158. Inward tilt of front wheels of a vehicle, from vertical, when viewed from the fro is called

(1) toe in
(2) castor
(3) steering axis inclination
(4) camber

159. Torsional coil springs used in automotive clutch plate

(1) ensure smooth engagement of clutch assembly
(2) damp engine torsional vibrations
(3) are provided for applying axial force on the pressure plate
(4) do not provide damping at all

160. Checking engine oil level before starting a long journey is an example of

(1) predictive maintenance
(2) breakdown maintenance
(3) preventive maintenance
(4) engine overhaul

161. Following should be used for tightening engine cylinder head bolts :

(1) Torque wrench
(2) Ring spanners
(3) Open-ended spanners
(4) Allen wrenches

162. The term CAN, with reference to automotive electronics, stands for

(1) Controllable Artificial Networks
(2) Computer Assisted Networks
(3) Controller Area Networks
(4) None of the above

163. _____ is the principal ingredient used in commercial catalysts to remove NO.

(1) Aluminium
(2) Rhodium
(3) Platinum
(4) None of the above

164. A diesel engine has excessive black smoke when started in the morning. Which of these could be the cause ?

(1) A bad fuel injector nozzle
(2) A restricted fuel filter
(3) A blocked fuel tank vent
(4) A leaking fuel return line

SPACE FOR ROUGH WORK

P.T.O.

165. Clashing of gears when shifting into high could result from
(1) engine misalignment (2) a defective synchronise
(3) drive key sheared (4) None of the above

166. Air resistance to a car at 20 km/hr is R. The air resistance at 40 km/hr would be
(1) R (2) 2R (3) 4R (4) R^2

167. Catalytic converter trouble is indicated by
(1) high CO and HC levels in the exhaust gas
(2) a rotten egg smell
(3) high engine noise level
(4) low H_2O level in the exhaust gas

168. Back-fire can take place
(1) in both the intake and exhaust manifolds
(2) only in the exhaust manifold
(3) only in the crank case
(4) only in the intake manifold

169. The carbon from cylinder head is removed with
(1) Scraper (2) Hammer
(3) Water (4) Caustic soda

170. Third party insurance safeguards the interest of
(1) third party only (2) driver only
(3) driver and third party (4) owner, third party and vehicle

171. The validity of insurance registration and age of vehicle are respectively as
(1) 3 years, life time (2) 1 year, 15 years
(3) 5 years, 10 years (4) Life time (any time), 20 years

172. India started to adopt European emission norms in the year
(1) 2000 (2) 2001 (3) 1999 (4) 2002

SPACE FOR ROUGH WORK

173. Payment of DTT (Day Time Tax) for LMV (Transport) is mandatory for the vehicles registered after May

(1) 1998 (2) 1999 (3) 2000 (4) 2002

174. Outside rear view mirror is of _____ type.

(1) Convex (2) Flat

(3) Concave (4) 'A' grade glass

175. Life Time Tax (LTT) on two wheelers in Maharashtra is based upon

(1) value/cost of the vehicle (2) engine capacity

(3) unladen weight (4) registered laden weight

176. Total seating capacity of Maxi cabs should ***not*** exceed more than _____ excluding the driver.

(1) 6 (2) 12 (3) 10 (4) 14

177. The exhaust gas recirculation (EGR) system is employed for controlling emission of

(1) CO (2) CO and HC

(3) HC, CO and CO_2 (4) NO_X

178. First automobile industry set up in India during 1949 is

(1) Premier Automobiles Ltd. (2) Automobile Product of India

(3) Mahindra and Mahindra Ltd. (4) Bajaj Tempo Ltd.

179. One Time Tax (OTT) is included on the basis of

(1) % of company cost vehicle (2) % of cost of vehicle

(3) % of total cost of road tax paid (4) None of the above

180. Power assisted steering is associated with

(1) improving the fuel efficiency (2) increasing the speed of the vehicle

(3) increasing the driver fatigue (4) minimising the driver fatigue

SPACE FOR ROUGH WORK

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 स्वतः बरोबर परीक्षाकक्षाबाहेर घेऊन जाण्यास परवानगी आहे. **मात्र परीक्षाकक्षाबाहेर जाण्यापूर्वी उमेदवाराने आपल्या उत्तरपत्रिकेचा भाग-1 समवेक्षकाकडे न विसरता परत करणे आवश्यक आहे.**

नमुना प्रश्न

प्रश्न 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 प्र.क्र. **201** समोरील उत्तर-क्रमांक "③" चा कंस 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