

**AE0915**

Test Booklet No.

**2112769**

**MECHANICAL ENGINEERING**

**Paper-2**

Series

**602**  
**A**

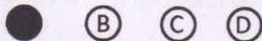
Duration : 150 Minutes

Max. Marks : 150

**INSTRUCTIONS TO CANDIDATES**

1. Please check the Test Booklet immediately on opening and ensure that it contains all the **150** multiple choice questions printed on it.
2. Separate Optical Mark Reader (OMR) Answer Sheet is supplied to you along with the Question Paper Booklet. The OMR Answer sheet consists of two copies i.e., the Original Copy (Top Sheet) and Duplicate Copy (Bottom Sheet). The OMR sheet contains Registered Number/Hall Ticket Number, Subject/Subject Code, Booklet Series, Name of the Examination Centre, Signature of the Candidate and Invigilator etc.
3. If there is any defect in the Question Paper Booklet or OMR Answer Sheet, please ask the invigilator for replacement.
4. Since the answer sheets are to be scanned (valued) with Optical Mark Scanner system, the candidates have to **USE BALL POINT PEN (BLUE/BLACK) ONLY** for filling the relevant blocks in the OMR Sheet including bubbling the answers. Bubbling with Pencil / Ink Pen/ Gel Pen is not permitted in the examination.
5. The Test Booklet is printed in four (4) Series, viz. A or B or C or D. The Series A or B or C or D is printed on the right-hand corner of the cover page of the Test Booklet. Mark your Test Booklet Series in Part C on side 1 of the Answer Sheet by darkening the appropriate circle with **Blue/Black Ball Point Pen**.

Example to fill up the Booklet Series :  
If your Test Booklet Series is A, please fill as shown below :



If you have not marked the Test Booklet Series at Part C of side 1 of the Answer Sheet or marked in a way that it leads to discrepancy in determining the exact Test Booklet Series, then, in all such cases, your Answer Sheet will be invalidated without any further notice.

6. Each question is followed by 4 answer choices. Of these, you have to select one correct answer and mark it on the Answer Sheet by darkening the appropriate circle for the question. If more than one circle is darkened, the answer will not be valued at all. Use Blue/Black Ball Point Pen to make heavy black marks to fill the circle completely. Make **no** other stray marks.  
e.g. : If the answer for Question No. 1 is Answer choice (2), it should be marked as follows:  
1.  ①  ②  ③  ④
7. Mark Paper Code and Roll No. as given in the Hall Ticket with Blue/Black Ball Point Pen by darkening appropriate circles in Part A of side 1 of the Answer Sheet. Incorrect/ not encoding will lead to **invalidation** of your Answer Sheet.

**Example:** If the Paper Code is 602 and Roll No. is 1309102001, fill as shown below :

Paper Code	Registered Number/Hall Ticket Number
6 0 2	1 3 0 9 1 0 2 0 0 1
<input type="radio"/> 6 <input checked="" type="radio"/> 0 <input type="radio"/> 2	<input type="radio"/> 1 <input type="radio"/> 3 <input type="radio"/> 0 <input type="radio"/> 9 <input type="radio"/> 1 <input type="radio"/> 0 <input type="radio"/> 2 <input type="radio"/> 0 <input type="radio"/> 0 <input type="radio"/> 1
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8. Please get the signature of the Invigilator affixed in the space provided in the Answer Sheet. An Answer Sheet without the signature of the Invigilator is liable for **invalidation**. Candidate should sign in the space provided on the OMR Answer Sheet.
9. Rough work should be done only in the space provided for that purpose in the Question Paper Booklet. No loose sheet of paper will be allowed into the Examination hall.
10. Do not mark answer choices on the Test Booklet. Violation of this will be viewed seriously.
11. In case of any discrepancy between English and Telugu Versions of the questions, English Version of the question shall be treated as final.
12. Use of Calculators, Mathematical Tables, Log Books, Pagers, Cell Phones or any other electronic gadgets is strictly prohibited.
13. The candidate should write the Question Paper Booklet Number and sign in the space provided in the Nominal Rolls while ensuring the Bio-data printed against his/her name is correct.
14. If the candidate notices any discrepancy printed on Hall tickets as to community, gender, date of birth etc., they may immediately bring to the notice of the Commission's officials/ Chief Superintendent in the examination centre and necessary corrections be made in the Nominal Roll, in the Examination Hall against his/her Hall Ticket Number for being verified by the Commission's Office.
15. The Commission would be analyzing the responses of a candidate with other appeared candidates to detect patterns of similarity. If it is suspected that the responses have been shared and the scores obtained are not genuine / valid, the Commission reserves the right to cancel his/her candidature and to invalidate the Answer Sheet.
16. (i) Whenever Written Examination is held, only those candidates who are totally blind are allowed to write the examination with the help of scribe and 20 minutes extra time is permitted to them per hour.  
(ii) An extra time of 20 minutes per hour is also permitted for the candidates with locomotor disability and CEREBRAL PALSY where dominant (writing) extremity is affected for the extent slowing the performance of function (Minimum of 40% impairment), scribe is allowed to such candidates.
- (iii) Scribe will be provided to those candidates who do not have both the upper limbs for Orthopedically handicapped. However, no extra time will be granted to them.  
(a) The scribe should be form an academic discipline other than that of the candidate and the academic qualification of the scribe should be one grade lower than the stipulated eligibility criteria.  
(b) The candidate as well as the scribe will have to give a suitable undertaking confirming the Rules applicable.
17. No candidate should leave the examination hall until completion of examination time.
18. Before leaving the examination hall, the candidate should handover the original OMR Answer Sheet (top sheet) to the Invigilator and carry the bottom sheet (duplicate) for his/her record, failing which action will be taken for malpractice.
19. The script will not be valued if the candidate :  
(i) Writes the Hall Ticket No. in any other place of OMR sheet, except in the space provided for the purpose.  
(ii) Writes irrelevant matter, including the religious symbols, words, prayers or any communication whatsoever, in any place of the OMR Answer Sheet.  
(iii) Uses other than Blue/Black Ball Point Pen to darken the circles.  
(iv) Forgetting to bubble the Test Booklet series or bubbling the other Test Booklet Series code than supplied to him/her.  
(v) Bubbling the circles incompletely or using ✓ or X or ⊙ in the circles.  
(vi) Using of whitener on the Answer Sheet is liable for invalidation of the candidature.  
(vii) If any type of tampering (rubbing the circles with chalk powder/scratching the circles with razors etc) is noticed will lead to invalidation of the candidature.  
(viii) Adopts any method of malpractice.
20. No correspondence will be entertained in this matter by the Commission, if the Answer Sheet of the candidate is invalidated/ rejected due to the above reasons.



### MECHANICAL ENGINEERING

- A closed system is one which
  - permits the passage of energy and matter across the boundaries.
  - does not permit the passage of energy and matter across the boundaries.
  - permit the passage of energy across the boundary but does not permit the passage of matter.
  - permit the passage of matter across the boundary but does not permit the passage of energy.
- A system undergoes a process in which the heat transfer to the system is 30 kJ and the work done by the system is 35000 Nm. The change in internal energy of the system is
  - + 5 kJ
  - 5 kJ
  - 10 kJ
  - + 10 kJ
- Select the correct statement as per Charles's law.
  - $PV = \text{Constant}$ , if T is kept constant.
  - $\frac{V}{T} = \text{Constant}$ , if P is kept constant.
  - $\frac{P}{V} = \text{Constant}$ , if T is kept constant.
  - $\frac{T}{P} = \text{Constant}$ , if T is kept constant.
- The area under P-V diagram of any thermodynamic process represents
  - Heat rejection
  - Heat absorption
  - Work done
  - Heat supplied
- A perfect gas at 27 °C is heated at constant pressure so as to triple its volume. The final temperature of the gas will be
  - 81 °C
  - 270 °C
  - 627 °C
  - 900 °C
- Calorific values of gaseous fuels is determined by
  - Bomb Calorimeter
  - Junker's Calorimeter
  - Separating Calorimeter
  - Throttling Calorimeter
- Otto cycle is also known as
  - Constant pressure cycle
  - Constant volume cycle
  - Constant temperature cycle
  - Constant temperature and pressure cycle
- A Carnot engine working between 600 °k and 300 °k produces 200 kJ of work. The heat supplied is
  - 200 kJ
  - 400 kJ
  - 2000 J
  - 400 J
- If the dryness fraction of steam (x) is less than '1', then the steam is called as
  - Dry steam
  - Super heated steam
  - Wet steam
  - Both (1) & (2)
- The C.O.P. of a refrigerator working on the reversed Carnot cycle is
  - $\frac{T_2}{T_1 - T_2}$
  - $\frac{T_1 - T_2}{T_2}$
  - $\frac{T_1}{T_1 - T_2}$
  - $\frac{T_2}{T_2 + T_1}$
- Which of the following is the boiler accessory ?
  - Blow-off cock
  - Pressure gauge
  - Water level indicator
  - Economiser



12. A device is used to put-off fire in the furnace of the boiler when the level of water in the boiler falls to an unsafe limit  
 (1) Blow-off cock (2) Stop valve (3) Super heater (4) Fusible plug
13. A steam nozzle converts  
 (1) heat energy of steam into kinetic energy  
 (2) kinetic energy into heat energy of steam  
 (3) potential energy into heat energy of steam  
 (4) both (2) & (3)
14. The process of maintaining the speed of the turbine constant for various load conditions is  
 (1) bleeding (2) reheating (3) governing (4) compounding
15. De-Laval turbine is a  
 (1) Simple impulse turbine (2) Simple reaction turbine  
 (3) Impulse reaction turbine (4) Both (2) & (3)
16. The positive displacement compressor is  
 (1) Roots blower compressor (2) Axial flow compressor  
 (3) Centrifugal compressor (4) Condenser
17. Gas turbine as compared to an internal combustion engine  
 (1) torque produced is uniform (2) can be driven at high speed  
 (3) has more efficiency (4) All the above
18. A closed cycle gas turbine works on  
 (1) Carnot cycle (2) Rankine cycle (3) Ericsson cycle (4) Joule cycle
19. Fuel injector is used in  
 (1) S.I. engines (2) C.I. engines (3) Gas engines (4) Steam engines
20. In a four stroke cycle diesel engine during suction stroke  
 (1) only air is sucked in  
 (2) only fuel is sucked in  
 (3) mixture of fuel and air is sucked in  
 (4) first air is sucked in, later fuel is sucked in
21. The spark ignition engines are governed by  
 (1) hit and mis-governing (2) qualitative governing  
 (3) quantitative governing (4) combined (2) & (3)
22. The ratio of brake power to indicated power of an I.C. engine is called as  
 (1) Mechanical efficiency (2) Thermal efficiency  
 (3) Volumetric efficiency (4) Relative efficiency
23. Which of the following is not a part of the vehicle chassis ?  
 (1) Wheels (2) Front axle (3) Steering system (4) Seats
24. The basic function of the suspension in an automobile is to  
 (1) absorb vibration and impact forces from the road surface  
 (2) automatically correct the effect of over steering  
 (3) ensure that the wheel alignment is not disturbed during driving  
 (4) ensure that the steering wheel can deliver a suitable amount of steering force



25. The stroke of an engine is the  
 (1) volume of the cylinder (2) length of the connecting rod  
 (3) internal diameter of the cylinder (4) distance between TDC and BDC
26. The process of infiltration in sintered product is to improve  
 (1) porosity (2) dimensional accuracy  
 (3) surface finish (4) coherent property
27. The factors influencing shrinkage during sintering include (i) particle size, (ii) pressure used, (iii) sintering temperature, (iv) pressing time  
 (1) (i), (ii) and (iv) (2) (ii) and (iv)  
 (3) (i) and (iv) (4) (i), (ii), (iii) and (iv)
28. Acute angle attachment is available in  
 (1) Taper plug gauge (2) Sine bar  
 (3) Angle gauges (4) Bevel protractor
29. Auto collimator uses  
 (1) white light (2) monochromatic light  
 (3) mercury light (4) sodium vapour light
30. Roughness grade symbol "two triangles" corresponds to the roughness grade number  
 (1) three (2) four (3) five (4) eight
31. In Electrochemical machining, the gap maintained between tool and work-piece is the order of  
 (1) 0.05 mm (2) 0.1 mm (3) 0.5 mm (4) 1 mm
32. Ultrasonic machining is best suited for  
 (1) tool steel (2) brass (3) diamond (4) stainless steel
33. When the metal is removed by erosion caused by rapidly recurring spark discharges between the tool and work, the process is known as  
 (1) Electrochemical machining (2) Electro discharge machining  
 (3) Ultrasonic machining (4) Abrasive jet machining
34. Green sand is a mixture of  
 (1) 30% sand, 70% clay (2) 50% sand, 50% clay  
 (3) 70% sand, 30% clay (4) 90% sand, 10% clay
35. A casting defect which occurs due to improper venting of sand is known as  
 (1) cold shuts (2) blow holes (3) shift (4) swell
36. In forging the upsetting process is  
 (1) increasing cross-section of bar (2) bending of bar  
 (3) decreasing cross-section (4) joining the two surfaces of metal
37. The fullers are used for  
 (1) finishing flat surfaces (2) punching a hole  
 (3) necking down operation (4) finishing a punched hole
38. The current in resistance welding can be regulated by  
 (1) varying input supply  
 (2) changing primary turns of transformer  
 (3) changing secondary turns of transformer  
 (4) None of the above



39. In arc welding, the temperature of heat produced by the electric arc is the order of
- (1) 3000 °C to 4000 °C (2) 4000 °C to 5000 °C  
 (3) 5000 °C to 6000 °C (4) 6000 °C to 7000 °C
40. For Arc welding
- (1) Alternating current with high frequency is used.  
 (2) Alternating current with low frequency is used.  
 (3) Direct current is used.  
 (4) All the above
41. The acetylene cylinder is usually painted with
- (1) black colour (2) white colour (3) maroon colour (4) yellow colour
42. In thermit welding, the thermit is the mixture of
- (1) Aluminium and Iron oxide (2) Oxygen and Acetylene  
 (3) Aluminium oxide and Cobalt powder (4) Aluminium and Bauxite
43. The lathe bed is made of
- (1) Mild steel (2) Alloy steel (3) Pig iron (4) Chilled Cast Iron
44. A lathe with four steps on the cone pulley and with back gears will have
- (1) four direct speeds (2) four direct and four indirect speeds  
 (3) four indirect speeds (4) eight indirect speeds
45. For performing operations like drilling, reaming on a work-piece at the same time, the following machine will be used.
- (1) Sensitive drilling machine (2) Radial drilling machine  
 (3) Gang drilling machine (4) Multiple spindle drilling machine
46. The operation performed on a shaper is
- (1) machining horizontal surface (2) machining vertical surface  
 (3) machining angular surface (4) All of these
47. The method of grinding used to produce a straight or tapered surface on a work-piece is
- (1) internal cylindrical grinding (2) form grinding  
 (3) external cylindrical grinding (4) surface grinding
48. The process of removing metal by a cutter which is rotating in the same direction of travel of work-piece is called
- (1) upmilling (2) down milling (3) face milling (4) end milling
49. A broach has the following teeth :
- (1) Rough teeth (2) Semi-finishing teeth  
 (3) Finishing teeth (4) All of the above
50. The broaching operation in which either the work or tool moves across the other is known as
- (1) pull broaching (2) push broaching  
 (3) surface broaching (4) continuous broaching
51. The horizontal and vertical components of a force of 200 N acting on a body at an angle of 30° with the horizontal is
- (1)  $100\sqrt{3}$  N and 100 N (2)  $\frac{400}{\sqrt{3}}$  N and 400 N  
 (3)  $200\sqrt{3}$  N and 200 N (4)  $300\sqrt{3}$  N and 300 N



52. A 12 kN force produces a moment of 96 kN-m. Then, the moment arm is  
 (1) 2 m (2) 4 m (3) 6 m (4) 8 m
53. The coefficient of friction is the ratio of  
 (1) the normal reaction to the limiting force of friction  
 (2) the weight of the body to limiting force of friction  
 (3) the limiting force of friction to the normal reaction  
 (4) the weight of the body to the normal reaction
54. The velocity ratio of a lifting machine is 20 and an effort of 200 N is necessary to lift a load of 3000 N. The frictional load is  
 (1) 7000 N (2) 1000 N (3) 50 N (4) 350 N
55. The centre of gravity of a hemisphere of diameter 80 mm from its base diameter is  
 (1) 15 mm (2) 40 mm (3) 20 mm (4) 10 mm
56. The base of triangle is 60 mm and height is 50 mm. The moment of inertia about its base 'AB' is  
 (1) 2,08,333.33 mm<sup>4</sup> (2) 6,25,000 mm<sup>4</sup> (3) 9,00,000 mm<sup>4</sup> (4) 3,00,000 mm<sup>4</sup>
57. The algebraic sum of the moments of a given system of forces about any point in the plane of forces is equal to the moment of their resultant about the same point. This statement is the  
 (1) Law of moments (2) Lami's theorem  
 (3) Varignon's principle (4) Triangle law of forces
58. If the body falls freely under gravity, then the gravitational acceleration is taken as  
 (1) +8.91 m/s<sup>2</sup> (2) -8.91 m/s<sup>2</sup> (3) +9.81 m/s<sup>2</sup> (4) -9.81 m/s<sup>2</sup>
59. The force applied on a body of mass 100 kg to produce an acceleration of 5 m/s<sup>2</sup> is  
 (1) 500 N (2) 100 N (3) 20 N (4) 10 N
60. A body is pulled through a distance of 15 m along a level track. The force applied is 400 N, acting at an angle of 60° to the direction of motion. Then the work done is  
 (1) 13.33 N-m (2) 3000 N-m (3) 5196.15 N-m (4) 26.66 N-m
61. The maximum acceleration of a particle moving with SHM is  
 (1)  $\omega^2$  (2)  $\omega r$  (3)  $\omega^2/r$  (4)  $\omega^2 r$
62. The speed of a particle moving in circular path is 600 rpm. Then, the angular velocity of that particle is  
 (1)  $20\pi$  rad/sec (2)  $10\pi$  rad/sec (3)  $20/\pi$  rad/sec (4)  $10/\pi$  rad/sec
63. The rivet of a rivetted joint is subjected to  
 (1) Tensile stress (2) Compressive stress  
 (3) Shear stress (4) Complementary stress
64. A hole of 20 mm diameter is punched in a plate of 10 mm thick. The shear stress induced in the plate is 0.4 kN/mm<sup>2</sup>. Then, the force exerted by the punch is  
 (1)  $500\pi$  kN (2)  $80\pi$  kN (3)  $800\pi$  kN (4)  $8000\pi$  kN
65. The strain energy stored in a body when the load is gradually applied is  
 (1)  $\frac{\sigma E}{V}$  (2)  $\frac{\sigma V}{E}$  (3)  $\frac{\sigma^2 E}{2V}$  (4)  $\frac{\sigma^2 V}{2E}$

Where  $V$  = Volume of body  
 $\sigma$  = Stress in the body  
 $E$  = Young's modulus



66. The hoop stress in a thin cylinder is  
 (1) half of the longitudinal stress (2) equal to longitudinal stress  
 (3) twice the longitudinal stress (4) four times the longitudinal stress

67. In a leaf spring, the deflection at its centre is  
 (1)  $\delta = Wl^3/8 Enbt^3$  (2)  $\delta = Wl^3/4Enbt^3$   
 (3)  $\delta = 3Wl^3/8Enbt^3$  (4)  $\delta = Wl^3/2Enbt^3$

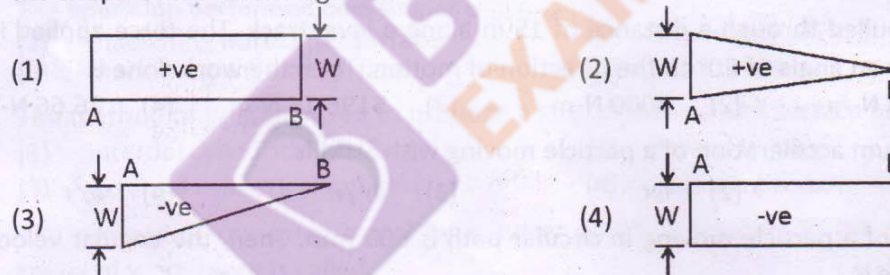
(Where  $W$  = Max. load on the spring  
 $l$  = length of the spring  
 $n$  = No. of plates  
 $b$  = Width of the plates  
 $t$  = thickness of the plates)

68. The maximum deflection of a cantilever beam with point load at its free end is given by  
 (1)  $y_{\max} = \frac{Wl^2}{2EI}$  (2)  $y_{\max} = \frac{Wl^3}{3EI}$  (3)  $y_{\max} = \frac{Wl^3}{2EI}$  (4)  $y_{\max} = \frac{Wl^2}{3EI}$

69. Section modulus of a square section of side 'b' is equal to  
 (1)  $b^3/6$  (2)  $b^2/6$  (3)  $b/6$  (4)  $b^3/3$

70. The maximum bending moment of a square beam of section modulus  $\frac{200^3}{6} \text{ mm}^3$  is  $20 \times 10^6 \text{ N-mm}$ . The maximum shear stress induced in the beam is  
 (1)  $30 \text{ N/mm}^2$  (2)  $7.5 \text{ N/mm}^2$  (3)  $45 \text{ N/mm}^2$  (4)  $15 \text{ N/mm}^2$

71. The shear force of a cantilever beam of length 'L' with a point load 'W' at its free end is in the shape of the following :



72. The maximum bending moment of a simply supported beam of span 2m and carrying a point load 80 kN at the centre of the beam is  
 (1) 160 kN-m (2) 80 kN-m (3) 320 kN-m (4) 40 kN-m

73. A continuous beam is one which is  
 (1) fixed at both ends  
 (2) fixed at one end and free at the other end  
 (3) supported on more than two supports  
 (4) extending beyond the supports

74. The change in length due to tensile or compressive force acting on a body is given by (with usual notations)

(1)  $\delta l = AE/Pl$  (2)  $\delta l = Pl/AE$  (3)  $\delta l = PE/Al$  (4)  $\delta l = Pl/AE$

75. The velocity ratio of a lifting machine is '8', which lifts a load 900 N by an effort of 150 N. Then, the efficiency of the machine is

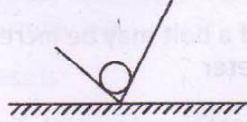
(1) 75 % (2) 70 % (3) 65 % (4) 60 %



76. According to Indian Standard specifications 50 H7/g6 means that the

- (1) actual size is 50 mm.
- (2) basic size is 50 mm.
- (3) difference between actual size and basic size is 50 mm.
- (4) max. size is 50 mm.

77. State the meaning of following machining symbol :



- (1) the surface is machined
- (2) removal of material by machining is required
- (3) removal of material is not permitted
- (4) obtained by any production method

78. The initial tension of M30 bolt used for a fluid tight joint is

- (1) 852 N
- (2) 852000 N
- (3) 8520 N
- (4) 85200 N

79. A shaft of 10 mm diameter, whose maximum shear stress is  $48 \text{ N/mm}^2$  can produce a maximum torque equal to

- (1)  $2000 \pi \text{ N-mm}$
- (2)  $4000 \pi \text{ N-mm}$
- (3)  $1000 \pi \text{ N-mm}$
- (4)  $3000 \pi \text{ N-mm}$

80. The splines are designated as "straight side spline  $18 \times 11 \times 112 - \text{IS} : 2610$ ". The meaning is the straight side spline of

- (1) length 18 mm, thickness 11 mm and width 112 mm
- (2) width 18 mm, length 11 mm and thickness 112 mm
- (3) width 18 mm, thickness 11 mm and length 112 mm
- (4) thickness 18 mm, width 11 mm and length 112 mm

81. Jockey pulley is used to

- (1) change the direction
- (2) change the velocity
- (3) reduce the belt tension
- (4) increase the angle of contact

82. The gear train used in an automobile differential is

- (1) simple gear train
- (2) compound gear train
- (3) reverted gear train
- (4) epicyclic gear train

83. In cams, the point on pitch curve which indicates the maximum angle is called

- (1) Trace point
- (2) Pitch point
- (3) Ball point
- (4) Pin point

84. The sensitiveness of the governor is equal to

- (1)  $\frac{\omega_1 - \omega_2}{\omega}$
- (2)  $\frac{\omega}{\omega_2 - \omega_1}$
- (3)  $\frac{\omega}{\omega_1 - \omega_2}$
- (4)  $\frac{\omega_2 - \omega_1}{\omega}$

(Where  $\omega_1$  = maximum speed

$\omega_2$  = minimum speed

$\omega$  = mean speed)

85. The radius of gyration for the solid disc flywheel is equal to

- (1)  $\frac{D}{2\sqrt{2}}$
- (2)  $\frac{D}{\sqrt{2}}$
- (3)  $\frac{D}{2}$
- (4)  $\frac{2\sqrt{2}}{D}$



86. The factor to be considered while designing a machine element is  
 (1) Selection of the materials (2) Effect of environment  
 (3) Mechanism (4) All the above
87. The surface roughness value for drilling process is  
 (1) 0.4 to 3.2 microns (2) 1.6 to 20 microns  
 (3) 0.063 to 5 microns (4) 0.8 to 6.3 microns
88. The shock absorbing capacity of a bolt may be increased by  
 (1) increasing its shank diameter  
 (2) loosening the bolt  
 (3) reducing the shank diameter equal to root diameter of screw  
 (4) tightening the bolt
89. The equivalent twisting moment to design a shaft subjected to the fluctuating loads will be given by  
 (1)  $\sqrt{(K_t M)^2 + (K_t T)^2}$  (2)  $\sqrt{(K_m M)^2 + (K_t T)^2}$   
 (3)  $\sqrt{K_m M + (K_m M)^2 + (K_t T)^2}$  (4)  $\frac{1}{2} [K_m M + \sqrt{(K_m M)^2 + (K_t T)^2}]$
90. To design the bolts of a flange coupling, the crushing stress induced in the bolts is equal to  
 (1)  $\frac{2T}{d_1 t_f n D_p}$  (2)  $\frac{2T}{d_1 t_f D_p}$  (3)  $\frac{2T}{d_1 n D_p}$  (4)  $\frac{4T}{d_1 t_f n D_p}$   
 (Where  $d_1$  = Nominal diameter of bolt;  
 $D_p$  = Pitch circle diameter ;  
 $n$  = no. of bolts ;  
 $t_f$  = thickness)
91. For maximum power transmission, the velocity of the belt which has the mass per metre length of the belt 1 kg and maximum tension of 1200 N is equal to  
 (1) 34.64 m/s (2) 24.49 m/s (3) 20 m/s (4) 29.6 m/s
92. The ratio of maximum fluctuation of energy to the work done per cycle is called as  
 (1) fluctuation of energy (2) coefficient of fluctuation of speed  
 (3) coefficient of fluctuation of energy (4) fluctuation of speed
93. When the sleeve of a porter governor moves upwards, the governor speed  
 (1) increases (2) decreases  
 (3) remains unaffected (4) first increases and then decreases
94. The average speed of chain on the sprocket is given by  
 (1)  $V = \frac{DN}{1000}$  m/min (2)  $V = \frac{PTN}{1000}$  m/min  
 (3)  $V = \frac{2\pi N}{1000}$  m/min (4)  $V = \frac{TN}{1000}$  m/min  
 (Where P = Pitch in mm  
 T = No. of teeth  
 N = Speed of sprocket  
 D = diameter of sprocket in mm)



95. When cam moves, the period during which the follower of cam remains at rest is known as  
 (1) constant period (2) fixed period (3) dwell period (4) idle period
96. Muntz metal contains  
 (1) 70% Copper, 30% Zinc (2) 60% Copper, 40% Zinc  
 (3) 59% Copper, 40% Zinc, 1% Tin (4) 60% Copper, 35% Zinc, 5% Nickel
97. The heat treatment process used for softening hardened steel is  
 (1) Carburising (2) Normalising (3) Annealing (4) Tempering
98. Annealing heat treatment process is  
 (1) refines grain structure (2) improve the hardness  
 (3) improves ductility (4) increases surface hardness
99. The toughness of a material, when it is heated  
 (1) decreases (2) increases (3) remains same (4) stabilise
100. In the induction hardening process, it is high  
 (1) current (2) voltage (3) frequency (4) temperature
101. An alloy of copper, tin and zinc is known as  
 (1) Brass (2) Bronze (3) Muntz metal (4) Gun metal
102. Mild steel is a  
 (1) low carbon steel (2) medium carbon steel  
 (3) high carbon steel (4) high speed steel
103. Corrosion resistance of steel is increased by adding  
 (1) Carbon (2) Manganese (3) Magnesium (4) Chromium
104.  $\gamma$ -alloy is an alloy of  
 (1) Nickel (2) Aluminium (3) Copper (4) Tin
105. The raw material required for making pig iron are  
 (1) coal, limestone, ore (2) ore, coke, wrought iron  
 (3) coke, limestone, ore (4) coal, coke, ore
106. Yellow brass is also known as  
 (1) Cartridge brass (2) Gun metal (3) Naval brass (4) Muntz metal
107. The temperature at which component losses or gains magnetic properties is  
 (1) Curie temperature (2) Upper critical point  
 (3) Lower critical point (4) Eutectic temperature
108. The mixture of ferrite and cementite is known as  
 (1) cementite (2) pearlite (3) ledeburite (4) Austinite
109. Iron carbon alloy with less than 2% carbon is called  
 (1) cast iron (2) pig iron (3) steel (4) wrought iron
110. The solidification of liquid at constant temperature into two phase mixture is called  
 (1) Peritectic reaction (2) Eutectoid reaction  
 (3) Hypo Eutectoid reaction (4) Eutectic reaction
111. Phase rule is given by  
 (1)  $P + F = C + 2$  (2)  $P + F = C - 2$  (3)  $P - F = C + 1$  (4)  $P + F = C - 1$



112. Annealing heat treatment is a  
 (1) slow cooling process (2) very slow cooling process  
 (3) very rapid cooling process (4) non-cooling process
113. Failure due to repeated or reversal stresses is called  
 (1) Hardness (2) Creep (3) Brittleness (4) Fatigue
114. Elasticity is the ability regarding its deformation to  
 (1) retain (2) regain (3) resist (4) uniform
115. The property of a metal existing in more than one crystalline form is  
 (1) Crystallisation (2) Solidification  
 (3) Polymorphism (4) Recalescence
116. Units for surface tension is expressed in  
 (1) N/m (2) N/m<sup>2</sup> (3) m/N (4) N<sup>2</sup>/m
117. Newton's law of viscosity is given by the relation  
 (1)  $\tau = \mu^2 \frac{du}{dy}$  (2)  $\tau = \sqrt{\mu} \frac{du}{dy}$  (3)  $\tau = \mu \frac{du}{dy}$  (4)  $\tau = \mu^3 \frac{du}{dy}$
118. The atmospheric pressure at sea level is  
 (1) 101.3 kN/m<sup>2</sup> (2) 10.3 m of water (3) 760 mm of Hg (4) All of these
119. The bourdon tubes are generally made of  
 (1) Mild steel (2) Bronze or Nickel steel  
 (3) Tin (4) Copper
120. The divergent portion of a venturimeter is made longer than convergent portion in order to  
 (1) avoid the tendency of breaking away the stream of liquid  
 (2) to minimise frictional losses  
 (3) both (1) & (2)  
 (4) to maximise frictional losses
121. The mean velocities of water at smaller end and larger end of a pipe are 20 m/s and 5 m/s respectively. If the area of the smaller end is 2500 mm<sup>2</sup>, then the area of larger end is  
 (1) 10,000 mm<sup>2</sup> (2) 1,000 mm<sup>2</sup> (3) 1,00,000 mm<sup>2</sup> (4) 100 mm<sup>2</sup>
122. A Pitot tube is used for measuring of  
 (1) total energy (2) pressure of flow (3) rate of flow (4) velocity of flow
123. The Reynold's number for turbulent flow is  
 (1) less than 2000 (2) greater than 4000  
 (3) between 2000 and 4000 (4) equal to 4000
124. The supply head of a pipe is 21 kPa. For maximum power transmission the loss of head due to friction is equal to (if  $w = 10 \text{ kN/m}^3$ )  
 (1) 2 m (2) 1 m (3) 9.81 m (4) 0.7 m
125. The line joining the sum of pressure heads and datum heads is called as  
 (1) Datum head line (2) Total energy line  
 (3) Piezometric line (4) Pressure head line
126. Reynold's number for flow through pipes is given by  
 (1)  $Re = \frac{\rho V D}{\mu}$  (2)  $Re = \frac{\mu V D}{\rho}$  (3)  $Re = \frac{\mu}{\rho V D}$  (4)  $Re = \frac{\rho}{\mu V D}$



127. According to Chezy's formula, the mean velocity of flow through the pipe is given by  
 (1)  $V = m\sqrt{Ci}$  (2)  $V = i\sqrt{mC}$  (3)  $V = C\sqrt{mi}$  (4)  $C = V\sqrt{mi}$
128. Force exerted by a jet of water impinging on a moving flat plate is  
 (1)  $\frac{W}{g} a(V-u)^2$  (2)  $\frac{W}{g} a(V-u)$  (3)  $\frac{W}{2g} a(V-u)^2$  (4)  $\frac{W}{2g} a(V-u)$
129. Which of the following turbine used for low heads of water ?  
 (1) Pelton wheel (2) Kaplan turbine (3) Francis turbine (4) Girard turbine
130. The condition for maximum efficiency of the Pelton wheel is that  
 (1) blade speed is one fourth of jet speed. (2) blade speed is one-third of jet speed.  
 (3) blade speed is one half of jet speed. (4) blade speed is equal to jet speed.
131. If the discharge of water is radial at the outlet, the hydraulic efficiency of the Francis turbine is given by  
 (1)  $\eta_H = \frac{V_{w_2} u_2}{gH}$  (2)  $\eta_H = \frac{gH}{V_{w_2} u_2}$  (3)  $\eta_H = \frac{gH}{V_{w_1} u_1}$  (4)  $\eta_H = \frac{V_{w_1} u_1}{gH}$
132. The function of the foot valve in a centrifugal pump is  
 (1) not to permit the liquid to move downwards back to the sump when the pump is not working.  
 (2) to permit the liquid to move downwards back to sump when the pump is not working.  
 (3) not to permit the liquid to move upwards from the sump when the pump is working.  
 (4) to permit the liquid to move downwards back to the sump when the pump is working.
133. Discharge (Q) of a centrifugal pump is given by  
 (1)  $Q = \pi D V_f$  (2)  $Q = \pi b V_f$   
 (3)  $Q = \pi D b V_f$  (4)  $Q = D b V_f$   
 (Where D = diameter of impeller at inlet  
 b = Width of the impeller at inlet  
 $V_f$  = Velocity of flow at inlet)
134. In reciprocating pump, the percentage of slip is equal to  
 (1) 1 - coefficient of discharge (2) 1 + coefficient of discharge  
 (3)  $\frac{1}{\text{coefficient of discharge}}$  (4)  $\frac{\text{coefficeint of discharge}}{\text{theoretical discharge}}$
135. Which of the following hydraulic machines are subjected to cavitation ?  
 (1) Impulse turbines only  
 (2) Reciprocating pumps only  
 (3) Reaction turbines and centrifugal pumps  
 (4) Impulse turbines and reciprocating pumps
136. The father of scientific management was  
 (1) F.W. Taylor (2) Henry Fayol (3) Gilberth (4) Gantt
137. Advantage in a line organisation is  
 (1) strong discipline (2) quick decision making  
 (3) simple to start (4) All of the above



138. In which of the following leadership style, the leader acts as a dictator ?  
 (1) Free-Rein leadership (2) Democratic leadership  
 (3) Autocratic leadership (4) All the above
139. Slack period represents the difference between the  
 (1) earliest completion time and latest allowable time  
 (2) earliest completion time and normal expected time  
 (3) latest allowable time and earliest completion time  
 (4) latest allowable time and normal allowable time
140. The type of production suitable for making bolts, nuts and washers is  
 (1) Batch production (2) Job production  
 (3) Flow production (4) Mass production
141. Fixed cost = ₹ 30,000, Selling price = ₹ 2 per unit, Variable cost = ₹ 1 per unit. The output to generate gain a profit of ₹ 30,000 is  
 (1) 30,000 units (2) 60,000 units (3) 15,000 units (4) 90,000 units
142. In inventory control the optimum (EOQ) lot size is given by  
 (1)  $\sqrt{\frac{2 \times \text{Carrying cost} \times \text{Annual demand}}{\text{Ordering cost}}}$  (2)  $\sqrt{\frac{2 \times \text{Annual demand} \times \text{Ordering cost}}{\text{Carrying cost}}}$   
 (3)  $\sqrt{\frac{4 \times \text{Demand} \times \text{Ordering cost}}{\text{Carrying cost}}}$  (4)  $\sqrt{\frac{2 \times \text{Carrying cost} \times \text{Ordering cost}}{\text{Annual demand}}}$
143. At the breakeven point  
 (1) Fixed cost = Variable cost (2) Total cost < Sales revenue  
 (3) Total cost > Sales revenue (4) Total cost = Sales revenue
144. The symbol 'Circle' indicates in work study is  
 (1) Operation (2) Inspection (3) Transport (4) Storage
145. Standard time is equal to  
 (1) normal time minus allowances  
 (2) normal time plus allowances  
 (3) normal time taken by an operation  
 (4) representative time multiplied by rating factor
146. Time study is carried out to determine the time required to complete job by  
 (1) slow worker (2) an average worker  
 (3) fast worker (4) an apprentice
147. Work sampling observations are taken on the basis of  
 (1) detailed calculations (2) convenience  
 (3) past experience (4) table of random numbers
148. Observed time for an element is 1 (one) minute. The rating factor is 90% and allowance of 20% of normal time. The standard time for this job is  
 (1) 0.9 minute (2) 1.8 minute (3) 1.18 minute (4) 1.08 minute
149. An allowance of time given to worker, who is working on more than two machines at a time is called  
 (1) Contingence allowance (2) Process allowance  
 (3) Interference allowance (4) Fatigue allowance
150. PMTS is a  
 (1) Predetermined Motion Time Systems  
 (2) Predetermined Method Time Systems  
 (3) Process of Motion and Time Study  
 (4) Process of Method and Time Study