


- by  
fill
1. Lewis equation in gears is used to find
- (1) tensile stress ✓
  - (2) fatigue stress
  - (3) contact stress
  - (4) bending stress
2. Diametral quotient is defined as
- (1) axial diameter/reference diameter
  - (2) pitch diameter/module
  - (3) module/pitch diameter
  - (4) pitch/pitch diameter
3. Interference is inherently absent in the following type of gear
- (1) Cycloidal ✓
  - (2) Stub
  - (3) Involute
  - (4) Hypocycloidal
4. Which of the following methods is preferred to make a shaft ?
- (1) Cold rolling
  - (2) Cold drawing
  - (3) Hot rolling
  - (4) Turning
5. Two shafts A and B are of the same length and material. If the diameter of the shaft A is three times the diameter of the shaft B, the ratio of torsional stiffness of shaft A and B is
- (1) 3
  - (2) 9
  - (3) 27 ✓
  - (4) 81
6. The most critically stressed point in a rotating shaft with a key way is
- (1) Start of the key way
  - (2) Middle of the key way
  - (3) End of the key way
  - (4) Any point on the key way ✓
7. Which of the following coupling provides kinematic flexibility ?
- (1) Pin type bush
  - (2) Oldham
  - (3) Split muff
  - (4) Flange ✓
8. Short shoe brakes have angle of contact less than
- (1) 10°
  - (2) 20° ✓
  - (3) 60°
  - (4) 45°
9. The number of effective surfaces with five steel and four brass plates in multiplate clutch is
- (1) 5
  - (2) 4
  - (3) 9
  - (4) 8 ✓
10. The ratio of the inner to the outer radius of the plate-type clutch varies between
- (1) 0.1 - 0.25
  - (2) 1 - 3
  - (3) 0.5 - 0.7 ✓
  - (4) 5 - 10
- Diam
- 3A - 240
- 

11. The type of clutch used on motors with low starting torque is
- (1) single plate clutch
  - (2) multiple plate clutch ✓
  - (3) cone clutch
  - (4) centrifugal clutch ✓
12. A journal rotating in the anticlockwise direction at slow speed inside a fluid bearing will be in contact
- (1) at the bottom position of the bearing
  - (2) towards the left side of the bearing ✓
  - (3) towards the right side of the bearing
  - (4) at the centre of the bearing
13. In a ball and roller bearing, the life vs reliability curve follows the
- (1) Normal distribution
  - (2) Straight line
  - (3) Weibull distribution ✓
  - (4) Binomial distribution
14. Which of the following bearings has a low starting friction?
- (1) Ball bearing ✓
  - (2) Roller bearing
  - (3) Journal bearing
  - (4) Taper roller bearing ✓
15. Which of the following is *not* a part of the I.C. engine?
- (1) Cylinder
  - (2) Piston
  - (3) Piston rod ✓
  - (4) Crank shaft
16. Low temperature at the end of combustion in the diesel engine is due to
- (1) High thermal efficiency
  - (2) High cooling rate ✓
  - (3) High air factor ✓
  - (4) Low air factor
17. Erosion of metal from the piston due to local welding is called
- (1) abrasive wear
  - (2) pitting ✓
  - (3) piston slap ✓
  - (4) scuffing ✓ ✓
18. For smooth and hard surface cylinder liner, it should be
- (1) chrome-plated ✓
  - (2) annealed
  - (3) hardened
  - (4) normalized
19. Whipping stress is called
- (1) crippling stress
  - (2) stress due to transverse bending ✓
  - (3) stress due to reciprocating mass inertia
  - (4) stress due to rotating inertia mass
20. In the plane of motion, the ends of the connecting rod are treated as
- (1) both fixed
  - (2) one fixed other hinged
  - (3) one fixed other free
  - (4) both hinged ✓



21. Engines of different cylinder dimensions, power and speed are compared on the basis of
- (1) maximum pressure
  - (2) fuel consumption
  - (3) mean effective pressure
  - (4) unit power ✓
22. Engines used for ships are normally *obj*
- (1) Four-stroke SI engines of very high power
  - (2) Two-stroke CI engines of very high power
  - (3) Four-stroke CI engines of high speed
  - (4) Two-stroke SI engines of high power
23. In a reciprocating engine with a cylinder diameter of  $D$  and stroke of  $L$ , the cylinder volume is *obj*
- (1)  $\frac{\pi D^2 L}{4} + \text{clearance volume}$
  - (2)  $\frac{\pi D^2 L}{4} - \text{clearance volume}$
  - (3)  $\frac{\pi D^2 L}{4} / \text{clearance volume}$  ✓
  - (4)  $\frac{\pi D^2 L}{4} * \text{clearance volume}$
24. Specific power of an IC engine is given by
- (1)  $ps = ip/A$
  - (2)  $ps = ip/V$  ✓
  - (3)  $ps = bp/A$
  - (4)  $ps = bp/V$
25. Inlet valve Mach index usually relates
- (1) mechanical efficiency
  - (2) relative efficiency
  - (3) brake thermal efficiency
  - (4) volumetric efficiency ✓
26. Mean effective pressure of Otto cycle is
- (1) inversely proportional to pressure ratio
  - (2) directly proportional to pressure ratio ✓
  - (3) does not depend on pressure ratio
  - (4) proportional to square root of pressure ratio
27. When the engines are built to withstand the same thermal and mechanical stresses
- (1) Diesel > Dual > Otto
  - (2) Dual > Diesel > Otto
  - (3) Otto > Dual > Diesel ✓
  - (4) Otto > Diesel > Dual ✓
28. For a given compression ratio, as the mixture is made progressively rich from lean, the mean effective pressure
- (1) increases
  - (2) decreases
  - (3) initially increases and then decreases ✓
  - (4) remains more or less
29. The major loss in an SI engine is due to
- (1) Exhaust blow down
  - (2) Pumping
  - (3) Incomplete combustion ✓
  - (4) Variation in specific heat and chemical equilibrium
30. The ratio of the actual efficiency and the fuel-air cycle efficiency for CI engines is about
- (1) 0.2 - 0.3
  - (2) 0.5 - 0.6 ✓
  - (3) 1.0 - 1.5
  - (4) 0.6 - 0.8

31. In diesel cycles compared to Otto cycle, the losses are
- (1) Lesser
  - (2) More ✓
  - (3) Equal
  - (4) None of the above
32. Valve overlap is the period in which
- (1) Intake valve is open while exhaust valve is closed
  - (2) Intake valve is closed while exhaust valve is open
  - (3) Both intake and exhaust valves are open ✓
  - (4) Both intake and exhaust valves are closed
33. The molecular structure of the straight-run gasoline is changed by
- (1) Cracking ✓
  - (2) Reforming ✓
  - (3) Refining
  - (4) Boiling
34. Which of the following statements is *not* correct with respect to alcohols as alternate fuels in IC engines ?
- (1) Anti-knock characteristics of alcohol is poor ✓
  - (2) Alcohol contains about half the heat energy of gasoline/litre
  - (3) Alcohol does not vaporize as easily as gasoline ✓
  - (4) Alcohols are corrosive in nature ✓
35. Octane number of natural gas is
- (1) 60 - 80
  - (2) 80 - 100 ✓
  - (3) > 100 ✓
  - (4) < 60
36. Venturi in the carburettor results in
- (1) Decrease of air velocity
  - (2) Increase of manifold vacuum
  - (3) Decrease of fuel flow
  - (4) Increase of air velocity ✓
37. The choke is closed when the engine is
- (1) Accelerating
  - (2) Hot
  - (3) Cold ✓ ✓
  - (4) Idling
38. Lean air mixture is required during
- (1) Idling
  - (2) Starting
  - (3) Accelerating
  - (4) Cruising ✓
39. Economizer is used to provide enriched mixture during
- (1) full throttle operation ✓
  - (2) cruising
  - (3) starting
  - (4) idling
40. When the throttle is suddenly opened, the mixture from the simple carburettor tends to become
- (1) rich
  - (2) lean ✓ ✓
  - (3) stoichiometric
  - (4) not affected



41. A simple carburettor supplies rich mixture during *om*
- (1) Starting ✓
  - (2) Idling
  - (3) Cruising
  - (4) Accelerating
42. Injection system in which the pump and the injector nozzle is combined in one housing is known as
- (1) Common rail system
  - (2) Distributor system
  - (3) Unit injector system ✓
  - (4) Individual pump and nozzle system
43. The most accurate gasoline injection system is *om*
- (1) Direct injection ✓
  - (2) Port injection
  - (3) Throttle body injection ✓
  - (4) Manifold injection
44. Common rail injection system uses injection pressures of the order
- (1) 100 - 200 bar
  - (2) 200 - 400 bar
  - (3) 400 - 600 bar
  - (4) 1500 bar ✓
45. With EFI of diesel engines
- (1) Sharp start and stop is not possible
  - (2) Very high injection pressure can be obtained ✓
  - (3) Sudden cylinder cut-off is impossible
  - (4) Diagnostic properties are poor
46. For a four cylinder engine operating at  $N$  rpm, the contact breaker must make and break the circuit
- (1)  $N$  times
  - (2)  $N/2$  times
  - (3)  $2N$  times ✓
  - (4)  $4N$  times
47. For a four cylinder vertical engine, the commonly used firing order is
- (1) 1-3-4-2 ✓
  - (2) 3-4-2-1
  - (3) 4-3-1-2
  - (4) 1-3-2-4
48. For engine operating with rich mixtures the optimum spark timing
- (1) must be advanced ✓
  - (2) must be retarded
  - (3) must be at TDC
  - (4) must be at BDC
49. Which of the following statements is wrong?
- (1) Retarded timing causes exhaust gas temperature to be higher
  - (2) Retarded timing improves fuel economy ✓
  - (3) Retarded timing requires slightly longer throttle opening
  - (4) Retarded timing causes burning of the hydrocarbons in the exhaust
50. To avoid leakage between engine cylinder & piston in IC engine, it is provided with
- (1) gasket
  - (2) oil rings
  - (3) compression rings ✓
  - (4) circlips

51. Detonation in SI engines occurs due to
- (1) Pre-ignition of the charge before the spark
  - (2) Sudden ignition of the charge before the spark
  - (3) Decreasing the compression ratio
  - (4) Auto ignition of the charge after the spark is struck ✓
52. In CI engines knocking tendency increases with
- (1) Increasing the compression ratio ✓
  - (2) Increasing inlet temperature of air
  - (3) Decreasing the compression ratio ✓
  - (4) Increasing coolant water temperature
53. The maximum pressure in the lubrication system is controlled by
- (1) Valve relief ✓
  - (2) Oil pump
  - (3) Supply voltage
  - (4) Oil filter
54. The lubricants commonly used in automobiles is
- (1) Animal oils
  - (2) Mineral oils ✓
  - (3) Vegetable oils
  - (4) Cotton oils
55. Splash lubrication system is mainly used in
- (1) Four-stroke petrol engine
  - (2) Wankel engine ✓
  - (3) Four-stroke diesel engine
  - (4) Two-stroke petrol engine ✓
56. The principal surfaces requiring lubrication in an IC engine are
- (1) Cylinder head ✓
  - (2) Crankcase
  - (3) Inlet and exhaust manifold
  - (4) None of the above
57. The heat given to cooling medium in IC engines is about
- (1) 50 - 60%
  - (2) 60 - 70%
  - (3) 30 - 40% ✓
  - (4) 10 - 20%
58. 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
59. Engine overheating may be due to
- (1) Struck radiator pressure cap
  - (2) Broken fan belt ✓
  - (3) Excess coolant
  - (4) Open thermostat
60. Strictest emission norms are initiated in the world first in
- (1) California
  - (2) New Delhi
  - (3) London ✓
  - (4) New York



61. One of the major exhaust emissions from CI engines compared to SI engines is
- (1) Oxides of nitrogen
  - (2) Un-burnt hydrocarbons
  - (3) Particulates ✓
  - (4) CO and CO<sub>2</sub>
62. Evaporative emission in SI engines account for emission of
- (1) 50% CO
  - (2) 50% HC
  - (3) 100% HC
  - (4) 25% HC ✓✓
63. The most accurate method of determining efficiency is by
- (1) Williams line
  - (2) Measurement of brake and indicated power ✓
  - (3) Motoring test
  - (4) Morse test
64. The air box/swept volume ratio should be in the range of \_\_\_\_\_ in single cylinder engines.
- (1) 10 - 100% ✓
  - (2) 200 - 300%
  - (3) 500 - 600% ✓
  - (4) > 1000%
65. In the air box method of measuring air flow, the air box is provided to
- (1) Damp out the pulsations ✓
  - (2) Have constant temperature
  - (3) Have constant flow
  - (4) Provide constant velocity of flow ✓
66. An indicator from an engine has a length of 100 mm and an area of 2000 mm<sup>2</sup>. If the indicator pointer deflects 10 mm for a pressure increment of 2 bar, the *mep* is
- (1) 2 bar
  - (2) 4 bar ✓✓
  - (3) 8 bar
  - (4) 1 bar
67. The *bp* of a four-cylinder engine is 30 with all cylinders firing and 20 with one cylinder cut. The mechanical efficiency is
- (1) 60%
  - (2) 80%
  - (3) 45%
  - (4) 75% ✓✓
68. The bore and stroke of a single cylinder four-stroke engine are 100 mm and 160 mm respectively. If the brake torque is 50 Nm the *bmep* is
- (1) 5 bar ✓
  - (2) 15 bar
  - (3) 10 bar
  - (4) 7.6 bar
69. For SI engine with engine speed, torque
- (1) Increases
  - (2) Decreases
  - (3) Remains constant
  - (4) Increases and then decreases ✓
70. At constant speed and constant air-fuel ratio for an SI engine
- (1) bsfc is maximum at full load
  - (2) bsfc is minimum at full load ✓
  - (3) bsfc is minimum at no load
  - (4) bsfc does not depend on load

PLAN  
 $\frac{100}{2000} \times 10 = 0.5$   
 $\frac{0.5}{2} = 0.25$

AMP = 30  
 = 20  
 $\frac{30}{20} = 1.5$

$d = 100$   
 $L = 160$   
 $T_{br} = 50$

71. Electro optical sensors are used for
- (1) Lubricating oil flow measurement
  - (2) Cooling water flow measurement
  - (3) Position and speed measurement ✓
  - (4) Piston temperature measurement
72. Volumetric efficiency of supercharged engine is
- (1) Between 100 - 110%
  - (2) Between 90 - 100%
  - (3) Between 80 - 90% ✓
  - (4) Between 70 - 80%
73. Supercharging increases the power output of the engine by
- (1) Increasing the charge temperature
  - (2) Increasing the charge pressure ✓
  - (3) Increasing the speed of the engine
  - (4) Quality of fuel admitted
74. Two wheelers without deflector type piston use
- (1) Loop scavenging
  - (2) Uniflow scavenging
  - (3) Reverse flow scavenging ✓
  - (4) Cross scavenging
75. Crankcase scavenged engines have delivery ratio of
- (1) Greater than 1
  - (2) Less than 1 ✓
  - (3) Equal to 1
  - (4) Greater than or Less than 1
76. If the delivery ratio is 1.8, the excess air factor in the case of a two-stroke engine is
- (1) 0.8 ✓
  - (2) 0.9
  - (3) 1.0
  - (4) 1.5
77. Stoichiometric air-fuel ratio of petrol is roughly
- (1) 50 : 1
  - (2) 25 : 1
  - (3) 15 : 1 ✓
  - (4) 10 : 1
78. In a two stroke IC engine, the piston top has a deflector for
- (1) Better combustion of fuel
  - (2) Better scavenging of exhaust gases ✓
  - (3) Better mixing of air and fuel
  - (4) Better charging of the cylinder
79. In a diesel engine, fuel consumption against brake power is
- (1) Parabolic ✓
  - (2) Hyperbolic
  - (3) Ellipse
  - (4) Linear
80. In a diesel engine, ignition occurs due to high
- (1) Density of charge
  - (2) Temperature of air-fuel mixture
  - (3) Temperature of compressed air ✓
  - (4) Intensity spark in spark plug



81. By decreasing clearance volume, the volumetric efficiency of an IC engine
- (1) Increases ✓
  - (2) Decreases
  - (3) Remains constant
  - (4) First increases and then decreases
82. By use of cooling, which efficiency of an IC engine improves? *ohj*
- (1) Volumetric efficiency ✓
  - (2) Mechanical efficiency
  - (3) Charging efficiency
  - (4) Thermal efficiency
83. In a bomb calorimeter, the fuel burns at constant
- (1) Volume ✓
  - (2) Pressure
  - (3) Temperature ✓
  - (4) Entropy
84. The efficiency of air standard Otto cycle depends on
- (1) Pressure ratio in the cycle
  - (2) Temperature ratio in the cycle
  - (3) Compression ratio in the cycle ✓
  - (4) Mean effective pressure
85. Which one of the following is part of air standard Atkinson cycle?
- (1) Isothermal heat addition ✓
  - (2) Constant-volume heat addition
  - (3) Constant-pressure heat addition
  - (4) Constant-volume heat rejection
86. The efficiency of a cycle is maximum when it is
- (1) Diesel cycle engine *W?*
  - (2) Otto cycle engine ✓
  - (3) Dual cycle engine
  - (4) Reversible engine ✓
87. For same maximum pressure and temperature among Otto, diesel and dual cycles *ohj*
- (1) Diesel cycle is most efficient
  - (2) Otto cycle is most efficient ✓
  - (3) Dual cycle is most efficient
  - (4) Stirling cycle is most efficient
88. Deep groove ball bearing is used for
- (1) Heavy thrust load only
  - (2) Radial load at high speed ✓
  - (3) Combined thrust and radial loads at high speed
  - (4) Small angular displacement of the shafts
89. A transmission shaft subjected to bending must be designed on the basis of
- (1) Fatigue strength ✓
  - (2) Rankine's theory
  - (3) Maximum shear stress theory ✓
  - (4) Rankine's theory and guest theory- ✓
90. The life of a ball bearing is inversely proportional to
- (1) (load)<sup>2</sup>
  - (2) (load)<sup>3</sup>
  - (3) (load)<sup>1/3</sup> ✓ *2 L x 1*
  - (4) (load)<sup>3-33</sup>

91. A ball bearing ( $k = 3$ ) is operating at a load 'F' for 8000 hrs of life. The life of the bearing (in hrs) when load is doubled to '2F' is
- (1) 6000 hrs
  - (2) 2000 hrs
  - (3) 8000 hrs
  - (4) 1000 hrs
92. A solid shaft can resist a bending moment of 2 kNm and a twisting moment of 3 kNm together. Then the maximum torque that can be applied is
- (1) 3.6 kNm
  - (2) 3607 kNm
  - (3) 2000 kNm
  - (4) 5.2 kNm
93. A full journal bearing 100 mm in diameter and 100 mm long has to support a radial load of 50 kN at an operating speed of 900 rpm. It should operate at a Sommerfeld number of 0.09 when the radial clearance is 0.2 mm. The power loss in bearing if co-efficient of friction is 0.0032 will be
- (1) 1000 W
  - (2) 457 W
  - (3) 545 W
  - (4) 752 W
94. A spur gear transmits 11 kW at a pitch line velocity of 10 m/s. Driving gear has a diameter of 2 m. The torque transmitted is
- (1) 2000 Nm
  - (2) 2200 Nm
  - (3) 1100 Nm
  - (4) 3200 Nm
95. For same output, same speed and same compression ratio the thermal efficiency of two-stroke cycle petrol engine as compared to that for four-stroke cycle petrol engine is
- (1) More
  - (2) Less
  - (3) Compression ratio is same
  - (4) Output is same
96. The thermal efficiency of good IC engine at the rated load is in the range of
- (1) 30 - 35%
  - (2) 10 - 20%
  - (3) 60 - 70%
  - (4) 80 - 90%
97. In SI engine, to develop high voltage for spark plug
- (1) Battery is installed
  - (2) Distributor is installed
  - (3) Carburettor is installed
  - (4) Ignition coil is installed



98. The torque developed by the engine is maximum at
- (1) Minimum speed of the engine
  - (2) Maximum speed of the engine
  - (3) Maximum volumetric efficiency of the engine ✓
  - (4) Maximum power speed of engine
99. The knocking tendency in petrol engines will increase when
- (1) Speed is decreased ✓
  - (2) Speed is increased
  - (3) Fuel-air ratio is made rich
  - (4) Fuel-air ratio is made lean ✓
100. Petrol commercially available in India for Indian passenger cars has octane number in the range
- (1) 40 - 50
  - (2) 80 - 85 ✓
  - (3) 60 - 70
  - (4) 95 - 100
101. Thermal converters cannot reduce emission of
- (1) CO
  - (2) HC
  - (3)  $\text{NO}_x$
  - (4) Soot ✓
102. Decrease in air-fuel ratio in SI engines results in
- (1) Increase of  $\text{NO}_x$
  - (2) Decrease of  $\text{NO}_x$
  - (3) Decrease of CO and UBHC
  - (4) Increase of CO and UBHC ✓
103. A carbon steel shaft of a rotating machine supported on two bearings at the ends is found to have excessive deflection. What design modification would you suggest to reduce the deflection?
- (1) Reduce the shaft speed
  - (2) Use of shaft larger diameter ✓
  - (3) Change the material of the shaft to alloy steel
  - (4) Change the bearing to self-alignment type
104. Hooks joint is used to connect shafts, which are
- (1) In substantial angular misalignment ✓
  - (2) Parallel but eccentric
  - (3) Concentric
  - (4) Likely to displace axially
105. Commonly used brake in automobiles is
- (1) Shoe brake
  - (2) Band block brake
  - (3) Band brake
  - (4) Internal expanding brake ✓

106. In design of a disc clutch, it is usual practice to assume the frictional torque =  $\beta \times$  normal running torque, where  $\beta$  is

- (1) Life factor
- (2) Wear factor
- (3) Engagement factor
- (4) Reliability factor

107. A shaft is subjected to both radial and axial loads. The suitable bearing for the shaft is a

- (1) Taper roller bearing
- (2) Full sleeve journal bearing
- (3) Roller bearing
- (4) Thrust bearing

108. If  $b$  denotes the face width and  $L$  the cone distance, the bevel factor is written as

- (1)  $b/L$
- (2)  $1 - b/L$
- (3)  $b/2L$
- (4)  $1 - 2bL$

109. Hollow and solid shafts are of equal weight. The hollow shaft has

- (1) Lower strength but greater stiffness
- (2) Lower strength but lower stiffness
- (3) Greater strength but lower stiffness
- (4) Greater strength and also greater stiffness

110. The equivalent co-efficient of friction ( $\mu_1$ ) for angular threads is equal to

- (1)  $\mu \cos \beta$
- (2)  $\mu \sin \beta$
- (3)  $\mu/\cos \beta$
- (4)  $\mu/\sin \beta$

111. The equivalent co-efficient of friction for V-threads is

- (1) Equal to actual co-efficient of friction
- (2) Greater than the actual co-efficient friction
- (3) Constant actual co-efficient of friction
- (4) Less than the actual co-efficient friction

112. The total angle of metric threads is  $60^\circ$ . If the actual co-efficient of friction between thread and nut is 0.15, then the value of equivalent co-efficient of friction will be

- (1) 0.1730
- (2) 0.1250
- (3) 0.225
- (4) 0.245

113. In case of flat pivot bearing, the rubbing velocity is

- (1) Maximum at the centre of the contact area
- (2) Uniform through the contact area
- (3) Zero at the centre and maximum at outer radius
- (4) Zero at the outer radius



A

IVMA/630

(15)

A

114. The ratio of frictional torque transmitted for uniform pressure to the frictional torque for uniform wear in case of flat pivot, is equal to

- (1) 1/3
- (2) 2/3
- (3) 2/6
- (4) 4/3

115. The maximum efficiency of a screw jack is a function of

- (1) Helix angle
- (2) Angle of friction
- (3) Load lifted
- (4) Effort

116. The involute function  $[\text{INV}(\phi)]$  in terms of pressure angle  $(\phi)$  is expressed as

- (1)  $\text{INV}(\phi) = \phi - \tan \phi$
- (2)  $\text{INV}(\phi) = 1 - \tan \phi$
- (3)  $\text{INV}(\phi) = \tan \phi - \phi$
- (4)  $\text{INV}(\phi) = 1 + \tan \phi$

117. The work wasted in friction, for a given total arc of action between gear teeth, will be minimum when arc of approach is

- (1) Equal to arc of recess
- (2) Half of arc of recess
- (3) Twice the arc of recess
- (4) One-fourth the arc of recess

118. The gear train usually employed in clocks is

- (1) Reverted gear train
- (2) Simple gear train
- (3) Differential gear
- (4) Epicyclic gear train

119. In the case of an involute toothed gear, involute starts from

- (1) Addendum circle
- (2) Dedendum circle
- (3) Pitch circle
- (4) Base circle

120. When two shafts are neither parallel nor intersecting, power can be transmitted by using

- (1) a pair of spur gears
- (2) a pair of spiral gears
- (3) a pair of helical gears
- (4) an Oldham's coupling

121. The critical speed of a shaft is affected by the
- (1) Diameter and the eccentricity of the shaft ✓
  - (2) Span and the eccentricity of the shaft
  - (3) Diameter and the span of the shaft
  - (4) Span of the shaft
122. If the annular wheel of an epicyclic gear train has 100 teeth and the planet wheel has 20 teeth, the number of teeth on the sun wheel
- (1) 80
  - (2) 60
  - (3) 40
  - (4) 20
123. Which type of gears is used for shaft axes having an offset?
- (1) Mitre gears
  - (2) Spiral bevel gears
  - (3) Zerol gears
  - (4) Hypoid gears ✓
124. Which one of the following causes the whirling of shafts?
- (1) Non-homogeneity of shaft material ✓
  - (2) Misalignment of bearings
  - (3) Fluctuation of speed ✓
  - (4) Internal damping
125. An external gear with 60 teeth meshes with a pinion of 20 teeth, module being 6 mm. What is the centre distance in mm?
- (1) 120
  - (2) 180
  - (3) 240 ✓
  - (4) 300
126. Removal of metal particles from the race way of a rolling contact bearing is a kind of failure of bearing known as
- (1) Pitting ✓
  - (2) Wearing
  - (3) Spalling
  - (4) Scuffing
127. For bolts of uniform strength, the shank diameter is equal to
- (1) Major diameter of threads
  - (2) Nominal diameter of threads ✓
  - (3) Pitch diameter of threads
  - (4) Minor diameter of threads
128. The maximum efficiency of self locking screw is
- (1) 50% ✓
  - (2) 33%
  - (3) 66%
  - (4) 75%
129. Which one of the following types of bearings is employed in shafts of gear boxes of automobiles?
- (1) Hydro dynamic journal bearings
  - (2) Antifriction bearings ✓
  - (3) Multi lobed journal bearings
  - (4) Hybrid journal bearings
130. In the formulation of Lewis equation for toothed gearing, it is assumed that tangential tooth load  $F_1$  acts on the
- (1) Pitch point
  - (2) Tip of the tooth
  - (3) Whole face of tooth ✓
  - (4) Root of the tooth



131. A shaft can safely transmit 90 kW while rotating at a given speed. If this shaft is replaced by shaft diameter double of the previous one and rotated at half the speed of the previous, the power that can be transmitted by the new shaft is
- (1) 90 kW
  - (2) 180 kW
  - (3) 360 kW ✓
  - (4) 720 kW
132. Which one of the following statements is correct?  
Shafts used in heavy duty speed reducers are generally subjected to
- (1) Bending stress only
  - (2) Shearing stress only
  - (3) Combined bending and shearing stress only
  - (4) Bending, shearing and axial thrust simultaneously ✓
133. For a proper design and longer wear life
- (1) Wear load must be more than dynamic load ✓
  - (2) Wear load must be less than dynamic load
  - (3) Dynamic load must be more than endurance strength
  - (4) Wear load must be less than endurance strength
134. In a multiple-disc clutch, the axial intensity of pressure is not to exceed 0.2 MPa. The inner radius of the disc is 100 mm and is half the outer radius. The axial force per pair of contact surface in N is
- (1)  $2000 \pi$
  - (2)  $3000 \pi$
  - (3)  $4000 \pi$  ✓
  - (4)  $5000 \pi$
135. A shaft transmits 1000 kW of power at 100 rad/s. Then the torque transmitted in kN-m is
- (1) 0.1
  - (2) 1.0
  - (3) 10.0 ✓
  - (4) 100.0
136. An axle of machine part is subjected to
- (1) Transfer loads and bending moment
  - (2) Twisting moment only
  - (3) Twisting moment and axial load
  - (4) Bending moment and axial load
137. If the load on a ball bearing is halved, its life
- (1) Increases two times
  - (2) Increases eight times ✓
  - (3) Increases four times
  - (4) Remains unchanged
138. A thermo electric engine which consists of two dissimilar electric conductors connected at two junctions maintained at different temperatures, converts
- (1) Electric energy into heat energy
  - (2) Heat energy into electric energy ✓
  - (3) Mechanical work into electric energy
  - (4) Electric energy into mechanical work
139. A gas engine has a swept volume of 300 cc and clearance volume 25 cc. Its volumetric efficiency is 0.88 and mechanical efficiency is 0.90. The volume of the mixture taken in per stroke is
- (1) 248 cc
  - (2) 252 cc
  - (3) 264 cc ✓
  - (4) 286 cc

140. By higher octane number of SI fuel, it is meant that fuel has
- (1) Higher heating value
  - (2) Higher flash point
  - (3) Lower volatility
  - (4) Longer ignition delay ✓
141. Keeping other parameters constant, the brake power of diesel engine can be increased by
- (1) Decreasing the density of intake air
  - (2) Increasing the temperature of intake air
  - (3) Increasing the pressure of intake air ✓
  - (4) Decreasing the pressure of intake air
142. In an SI engine, which one of the following is the correct order of the fuels with increasing detonation tendency?
- (1) Paraffins, Olefins, Naphthalenes, Aromatics
  - (2) Aromatics, Naphthalenes, Paraffins, Olefins ✓
  - (3) Naphthalenes, Olefins, Aromatics, Paraffins
  - (4) Aromatics, Naphthalenes, Olefins, Paraffins
143. The presence of nitrogen in the products of combustion ensures that
- (1) Complete combustion of fuel takes place
  - (2) Air is used in the combustion
  - (3) Incomplete combustion of fuel occurs ✓
  - (4) Dry products of combustion are analyzed
144. In some carburetors, meter rod and economizer device is used for
- (1) Cold starting
  - (2) Power enrichment ✓
  - (3) Idling
  - (4) Acceleration
145. In a variable speed SI engine, the maximum torque occurs at the maximum
- (1) Speed
  - (2) Indicated power
  - (3) Brake power ✓
  - (4) Volumetric efficiency -
146. Auto ignition time for a petrol-air mixture is minimum when the ratio of actual fuel-air ratio and chemically correct fuel-air ratio is
- (1) 0.8
  - (2) 1.0
  - (3) 1.2 ✓
  - (4) 1.5
147. Which one of the following **cannot** be controlled by a three-way catalytic converter?
- (1) HC emission
  - (2) CO emission
  - (3) NO<sub>x</sub> emission
  - (4) SPM emission ✓
148. Which one of the following fuels can be obtained by fermentation of vegetable matter?
- (1) Benzene
  - (2) Diesel
  - (3) Gasoline
  - (4) Alcohol ✓
149. For conventional SI engine, the value of fuel-air ratio in the normal operating range is
- (1) 0.056 - 0.083 ✓
  - (2) 0.083 - 0.56
  - (3) 0.0056 - 0.83
  - (4) 0.056 - 0.83
150. A bore and stroke of the cylinder of a 6-cylinder engine working on an Otto cycle are 17 cm and 30 cm respectively, total clearance volume is 9225 cm<sup>3</sup>. Then what is the compression ratio?
- (1) 7.8
  - (2) 6.2
  - (3) 15.8
  - (4) 5.4 ✓

$$\frac{14825}{9225} = 1.61$$

$$\frac{17 \times 30}{5100} = 1.0$$

$$\frac{14825}{9225} - 1.0 = 0.61$$

$$\frac{0.61}{0.5} = 1.22$$

$$1.22 + 1.0 = 2.22$$