Sl. No. : 50001325

MPDE 2012

Register Number | | | | | | | | |

2012
MECHANICAL AND PRODUCTION ENGINEERING
(Degree Standard)

Time Allowed : 3 Hours] **[Maximum Marks : 300**

Read the following instructions carefully before you begin to answer the questions.

IMPORTANT INSTRUCTIONS

1. This Booklet has a cover (this page) which should not be opened till the invigilator gives signal to open it at the commencement of the examination. As soon as the signal is received you should tear the right side of the booklet cover carefully to open the booklet. Then proceed to answer the questions.
2. This Question Booklet contains **200** questions.
3. Answer **all** questions.
4. **All** questions carry equal marks.
5. You must write your Register Number in the space provided on the top right side of this page. Do not write anything else on the Question Booklet.
6. An Answer Sheet will be supplied to you separately by the Invigilator to mark the answers. You must write your Name, Register No., Question Booklet Sl. No. and other particulars with Blue or Black ink Ball point pen on side 2 of the Answer Sheet provided, failing which your Answer Sheet will not be evaluated.
7. You will also encode your Register Number, Subject Code, Question Booklet Sl. No. etc. with Blue or Black ink Ball point pen in the space provided on the side 2 of the Answer Sheet. If you do not encode properly or fail to encode the above information, your Answer Sheet will not be evaluated.
8. Each question comprises *four* responses (A), (B), (C) and (D). You are to select ONLY ONE correct response and mark in your Answer Sheet. In case, you feel that there are more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each question. Your total marks will depend on the number of correct responses marked by you in the Answer Sheet.
9. In the Answer Sheet there are **four** brackets [A] [B] [C] and [D] against each question. To answer the questions you are to mark with Ball point pen ONLY ONE bracket of your choice for each question. Select one response for each question in the Question Booklet and mark in the Answer Sheet. If you mark more than one answer for one question, the answer will be treated as wrong *e.g.* If for any item, [B] is the correct answer, you have to mark as follows :

[A] ■ [C] [D]

10. You should not remove or tear off any sheet from this Question Booklet. You are not allowed to take this Question Booklet and the Answer Sheet out of the Examination Hall during the examination. After the examination is concluded, you must hand over your Answer Sheet to the Invigilator. You are allowed to take the Question Booklet with you only after the Examination is over.
11. Failure to comply with any of the above instructions will render you liable to such action or penalty as the Commission may decide at their discretion.
12. Do not tick-mark or mark the answers in the Question booklet.
13. The last sheet of the Question Booklet can be used for Rough Work.

SEAL

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1. The unit of moment of inertia of an area is

(A) $kg\text{-}m^2$ (B) $kg\text{-}m\text{-}s^2$

(C) kg/m^2 (D) m^4

2. The velocity ratio of a simple wheel and axle with D and d as the diameters of effort wheel and load axle is

(A) D + d (B) D – d

(C) D × d (D) D/d

3. A redundant frame is also called

(A) perfect frame (B) imperfect frame

(C) deficient frame (D) None of the above

4. Theorem of perpendicular axis is used in obtaining the moment of Inertia of a

(A) triangular lamina (B) square lamina

(C) circular lamina (D) semi-circular lamina

5. Coulomb friction is the friction between

(A) bodies having relative motion (B) two dry surfaces

(C) two lubricated surfaces (D) solids and liquids

6. Moment of Inertia of a solid sphere is

(A) Mr^2 (B) $\frac{\pi r^4}{2}$

(C) $\frac{2}{5}Mr^2$ (D) $\frac{2}{3}Mr^2$

7. The velocity time graph of a body is a straight line passing through the origin. If the slope of the graph is m, the distance travelled by the body in time t would be

(A) $2mu^2$ (B) $\frac{mu^2}{2t}$

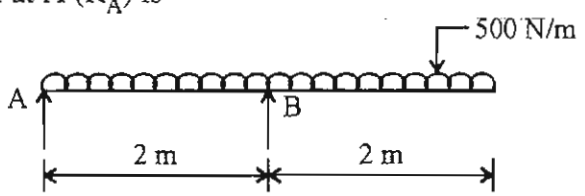
(C) $\frac{u^2}{2m}$ (D) none

8. The product of either force of couple with the arm of couple is called

(A) moment of forces (B) resultant couple

(C) moment of the couple (D) Resulting couple

9. For the overhanging beam carrying UDL as shown below, the magnitude of support reaction at A (R_A) is



(A) 1000 N (B) 750 N

(C) 500 N (D) zero

10. The Y-co-ordinate of centre of gravity (C.G.) of a semi-circular lamina is at a distance of _____ from the base diameter. The radius of the lamina is 'r'.

(A) $\frac{4r}{3\pi}$ (B) $\frac{3r}{\pi}$

(C) $\frac{3r}{4\pi}$ (D) $\frac{4r}{3}$

11. The universal gas constant (or molar constant) of a gas is the product of

(A) Molecular mass of the gas and the gas constant
(B) Atomic mass of the gas and the gas constant
(C) Molecular mass of the gas and the specific heat at Constant pressure
(D) Molecular mass of the gas and the specific heat at constant volume

12. In an irreversible process, there is a

(A) Loss of heat (B) No loss of heat
(C) Gain of heat (D) No gain of heat

13. Heat and work are

(A) point functions (B) system properties
(C) path functions (D) intensive properties

14. Change in enthalpy of a system is the heat supplied at

(A) constant pressure (B) constant temperature
(C) constant volume (D) constant entropy

15. When a system undergoes a process such that

$\int \frac{dQ}{T} = 0$ and $\Delta S > 0$ the process is

(A) inversible adiabatic (B) reversible adiabatic
(C) isothermal (D) isobaric

16. Increase in entropy of a system represents

(A) increase in availability of energy (B) increase in temperature
(C) decrease in pressure (D) degradation of energy

17. Reversed cannot cycle assumes that all processes in the cycle are

(A) non flow only (B) steady flow only
(C) non flow or steady flow only (D) transient flow

18. A refrigerator and heat pump operate between the same temperature limits. If C.O.P. of the refrigerator is 4. The C.O.P. of the pump would be

(A) 3 (B) 5
(C) 4 (D) cannot predict

19. The value of Gas constant (R) in S.I. units is

(A) 0.287 J/kg-K (B) 2.87 J/kg-K
(C) 28.7 J/kg-K (D) 287 J/kg-K

20. Processes occurring in open system which permit the transfer of mass and from the system, are known as
(A) flow processes
(B) non-flow processes
(C) adiabatic processes
(D) none of these

21. Fuel injection in a medium speed, 4-stroke diesel engine
(A) begins at TDC ends 20° after TDC
(B) begins 5° before TDC and ends 20° after TDC
(C) begins 10° before TDC and ends 20° after TDC
(D) begins 15° before TDC and ends 15° after TDC

22. In a 4 stroke SI engine, the inlet and the exhaust valves
(A) never open simultaneously
(B) always open simultaneously
(C) remain open together for about 20° crank position
(D) remain open together for about 40° crank position

23. The units of spring scale for the engine indicator are
(A) kW
(B) N
(C) N/m
(D) $N/m^2/m$

24. The most accurate dynamometer is the
(A) prony brake type
(B) hydraulic type
(C) swinging field type
(D) eddy current type

25. For the same maximum pressure and heat input, the most efficient cycle is
(A) Otto cycle
(B) Diesel cycle
(C) Brayton cycle
(D) Dual combustion cycle

26. In a petrol engine car which one of the following performance characteristics is affected by the front-end volatility of the gasoline used
(A) hot starting and vapour lock
(B) engine warm-up and spark plug fouling
(C) spark plug fouling and hot starting
(D) vapour lock, engine warm-up and spark plug fouling.

27. Power available at the shaft of an I.C. engine is known as
(A) brake horse power
(B) indicated horse power
(C) net indicated horse power
(D) pumping power

28. Term scavanging is generally related with
(A) two stroke engine
(B) vertical engine
(C) air cooled engine
(D) high speed engine

29. The ratio of brake power to the indicated power is known as
(A) Mechanical Efficiency
(B) Overall Efficiency
(C) Indicated Thermal Efficiency
(D) Brake Thermal Efficiency

30. In a petrol engine the delay period is of the order of
(A) 0.001 S
(B) 0.002 S
(C) 0.015 S
(D) 0.06 S

31. When the Mach-number is less than unity, the flow is called
(A) Sub-sonic flow
(B) Sonic flow
(C) Super-sonic flow
(D) Hyper-sonic flow

32. The flow through nozzle is considered as
(A) Constant volume flow
(B) Constant pressure flow
(C) Isothermal flow
(D) Isentropic flow

33. The critical pressure ratio for maximum discharge through a nozzle is given by
(A) $\left(\frac{n+1}{2}\right)^{\frac{n}{n-1}}$
(B) $\left(\frac{2}{n+1}\right)^{\frac{n}{n-1}}$
(C) $\left(\frac{n+1}{2}\right)^{\frac{n-1}{n}}$
(D) $\left(\frac{2}{n+1}\right)^{\frac{n-1}{n}}$

34. If the upstream Mach number of a normal shock occurring in air (k = 1.4) is 1.68 then the Mach number after the shock is
(A) 0.84
(B) 0.646
(C) 0.336
(D) 0.564

35. The material commonly used for air craft gas turbine is
(A) stainless steel
(B) high alloy steel
(C) duralumin
(D) Timken, Haste and Inconel alloy

36. The power available for take off and climb in case of Turbojet engine as compared to reciprocating engine is
(A) less
(B) more
(C) same
(D) may be less or more depending on ambient conditions

37. The bulk of the atmosphere is made up of oxygen and nitrogen and small quantities argon, helium and hydrogen are present. The total weight of the atmosphere is estimated to be
(A) 3×10^{15} tons
(B) 4×10^{15} tons
(C) 10^{15} tons
(D) 5×10^{15} tons

38. If the flow is assumed incompressible, the value of the pressure coefficient is
(A) $\frac{P_o - P}{\frac{1}{2}\rho_c^2} = 1$
(B) $\frac{P_o - P}{\rho_c^2} = 1$
(C) $\frac{P_o - P}{\frac{1}{2}\rho_c^2} = 0$
(D) $\frac{P_o - P}{\rho_c^2} = 0$

39. A Jet engine has
(A) propeller on the top
(B) propeller at the back
(C) propeller in front
(D) no propeller

40. The air fuel ratio is Ramjet is
(A) 5 : 1
(B) 10 : 1
(C) 15 : 1
(D) 30 : 1

41. Choose the wrong characteristic of a refrigerant :
(A) High latent heat
(B) Low boiling point
(C) High vapour specific volume
(D) Non-toxicity

42. The leak of refrigerant from a system is detected by
(A) halide torch test
(B) soap and water test
(C) sulphur candle test
(D) any of the above

43. Consider the following statements regarding refrigerants :
(1) Refrigerant NH_3 is used in reciprocating compressors.
(2) Refrigerant CO_2 is used in reciprocating compressors.
(3) Refrigerant R-11 is used in centrifugal compressors.
Which of these statements are correct ?
(A) (1) and (3)
(B) (1) and (2)
(C) (2) and (3)
(D) (1), (2) and (3)

44. The discharge pressure of the compressor in the Refrigeration system goes up due to the
(A) lower volumetric efficiency of the compressor
(B) formation of scale in the condenser
(C) large size of the condenser
(D) undercharge of the refrigerant

45. In a domestic refrigerator a capillary tube controls the flow of refrigerant from the
(A) expansion valve to the evaporator
(B) evaporator to the thermostat
(C) condenser to the expansion valve
(D) condenser to the evaporator

46. In aircraft, air refrigeration cycle is used because of
(A) law unit weight per tonne of refrigeration
(B) high heat transfer rate
(C) lower temperature at high-attitudes
(D) higher co-efficient of performance

47. In vapour compression refrigeration system, if expansion cylinder is used in place of throttle valve the C.O.P. will
(A) increase
(B) decrease
(C) same
(D) not predictable

48. Match :

(a)	R11	(1)	Monochloro diflouro methane
(b)	R12	(2)	Dichloro monoflouro methane
(c)	R22	(3)	Trichloro mono flouro methane
(d)	R21	(4)	Dichloro diflouro methane

	(a)	(b)	(c)	(d)
(A)	(2)	(3)	(4)	(1)
(B)	(3)	(4)	(1)	(2)
(C)	(4)	(2)	(3)	(1)
(D)	(1)	(4)	(2)	(3)

49. As warms air cools, its relative humidity
(A) decreases (B) increases
(C) remains unchanged (D) unpredictable

50. In air-conditioning system the comfort conditions are defined by
(A) 15 °C DBT, 90% RH (B) 25 °C DBT, 35% RH
(C) 20 °C DBT, 80% RH (D) 22 °C DBT, 60% RH

51. Prandtl number is the ratio of kinematic viscosity to
(A) Dynamic Viscosity (B) Bulk Modulus
(C) Dynamic Pressure (D) Thermal Diffusivity

52. Motion of liquid in a volute of a centrifugal pump is the example of
(A) Radial flow (B) Forced Cylindrical vortex flow
(C) Spiral Vortex flow (D) Free Cylindrical vortex flow

53. The flow rate through a circular pipe is measured by
(A) Pitot tube (B) Venturimeter
(C) Orifice meter (D) (B) & (C)

54. The loss of head due to sudden expansion of a pipe is given by
(A) $h_L = \frac{V_1^2 - V_2^2}{2g}$ (B) $h_L = \frac{0.5\, V_1^2}{2g}$
(C) $h_L = \frac{(V_1 - V_2)^2}{2g}$ (D) $h_L = \frac{0.25\, V_1^2}{2g}$

Where,
V_1 = Velocity of flow at section 1-1.
V_2 = Velocity of flow at section 2-2.

55. A centrifugal pump is started with its delivery valve kept
(A) fully open (B) fully closed
(C) partially open (D) 50% open

56. At the point of boundary layer separation
(A) shear stress is maximum (B) shear stress is zero
(C) velocity is negative (D) Density variation is maximum

57. Which one of the following is the bulk modulus k of a fluid ?
(A) $\frac{\rho dp}{d\rho}$ (B) $\frac{dp}{\rho d\rho}$
(C) $\frac{\rho d\rho}{dp}$ (D) $\frac{d\rho}{\rho dp}$

58. The dimensions of surface tension is
(A) N/m^2 (B) J/m
(C) J/m^2 (D) W/m

59. A large Reynold number is indication of
(A) smooth and streamline flow (B) laminar flow
(C) steady flow (D) highly turbulent flow

60. In a steady flow of a fluid, the acceleration of any fluid particle is
(A) constant
(B) variable
(C) zero
(D) never zero

61. Which of the following statement is correct ?
(A) The efficiency of steam turbine is greater than that of steam engines.
(B) A flywheel is must for steam turbine.
(C) The turbine Blades do not change the direction of steam issuing from the nozzle.
(D) The pressure of steam, in reaction turbines, is increased in fixed blades as well as in moving blades.

62. The ratio of total useful heat drop to the total isentropic heat drop is called,
(A) Stage efficiency
(B) Internal efficiency
(C) Rankine efficiency
(D) None of these

63. The purpose of a barring gear with steam turbine is to
(A) rotate the rotor and allow uniform cooling on tripping of turbine, thus avoiding warping of rotor
(B) crank the turbine
(C) test the alignment
(D) stop the turbine

64. Cylinder clearance in a compressor should be
(A) as large as possible
(B) as small as possible
(C) about 50% of swept volume
(D) about 100% of swept volume

65. A two stage compressor takes in air at 1.1 bars and discharges at 20 bar. For maximum efficiency the intermediate pressure is
(A) 10.55 bars
(B) 7.33 bars
(C) 5.5 bars
(D) 4.7 bars

66. The capacity of an air compressor is specified as $10m^3$/min. It means that the compressor is capable of
(A) supplying $3m^3$ of compressed air per minute
(B) compressing $3m^3$ of free air per minute
(C) supplying $3m^3$ of compressed air at NTP
(D) compressing $3m^3$ of standard air per minute

67. The following parameters relate to flow in a penstock :
(1) Water level in the reservoir
(2) Density of water
(3) Elasticity of water
(4) Roughness of pipe
(A) (1) and (2)
(B) (2) and (3)
(C) (3) and (4)
(D) All

68. A pumped storage plant is a
(A) high head plant
(B) run off river plant
(C) peak load plant
(D) base load plant

69. A pelton wheel is
(A) tangential flow impulse turbine (B) inward flow impulse turbine
(C) outward flow impulse turbine (D) inward flow reaction turbine

70. Kinematic similarity is said to exist between the model and the prototype. If both of them
(A) have identical velocities
(B) are equal in size and shape
(C) are identical in shape-but differ only in size
(D) have identical forces.

71. Ratio of Nusselt number to Pellet number is
(A) Reynolds Number (B) Grashof Number
(C) Prandtl Number (D) Stanton Number

72. A thermally transparent body is characterized by
(A) absorptivity = 1 (B) reflectivity = 1
(C) transmissibility = 0 (D) absorptivity = reflectivity = 0

73. Heat transfer takes place according to
(A) Zeroth Law of Thermodynamics (B) First Law of Thermodynamics
(C) Second Law of Thermodynamics (D) Third Law of Thermodynamics

74. Addition of fin to the surface increases the heat transfer if $\sqrt{hA/kP}$ is
(A) equal to one (B) greater than one
(C) less than one (D) greater than one but less than two

75. Compared to parallel flow heat exchanger, LMTD in case of counter flow heat exchanger is
(A) lower (B) higher
(C) same (D) unpredictable

76. Why are floating heads provided in heat exchangers ?
(A) To regulate the flow
(B) To increase the pressure drop
(C) To decrease the pressure drop
(D) To avoid deformation of tubes due to thermal expansion.

77. In a steady state conduction with variable thermal conductivity, if the conductivity decreases along the flow direction, then the temperature gradient along the flow direction, will become
(A) steeper
(B) flatter
(C) remains constant
(D) either of the three depending on heat flow rate

78. Fin effectiveness will be increased more by
(A) having higher value of convection coefficient
(B) higher sectional area
(C) higher thermal conductivity
(D) larger circumference

79. Up to the critical radius of insulation.
(A) added insulation will increase heat loss
(B) added insulation will decrease heat loss
(C) convective heat loss will be less than conductive heat loss
(D) heat flux will decrease

80. The Ratio of surface convection resistance to the internal conduction resistance is known as
(A) Grashoff number
(B) Biot Number
(C) Stanton Number
(D) Prandtl Number

81. Enriched Uranium is required as a fuel in a nuclear reactor, if light water is used as moderator and coolant, because light water has
(A) high neutron absorption cross-section
(B) low moderating efficiency
(C) high neutron scatter cross-section
(D) low neutron absorption cross-section

82. A power plant giving least running cost of production of electrical power is
(A) Steam power plant
(B) Gas turbine power plant
(C) Hydro electric power plant
(D) Nuclear power plant

83. Which of the following power plants use heat recovery boilers for steam generation ?
(1) Combined cycle power plants.
(2) All thermal power plants using coal.
(3) Nuclear power plants.
(4) Power plants using fluidised bed combustion.
Select the correct answer using codes :
(A) (1) and (2)
(B) (3) and (4)
(C) (1) and (3)
(D) (2) and (4)

84. The most commonly used moderator in nuclear power plants is
(A) CO_2
(B) concrete and bricks
(C) Steel
(D) Graphite

85. The fast breeder reactor uses the following moderator :
(A) Demineralised water
(B) No moderator is used
(C) Carbon dioxide
(D) Heavy water

86. The coolant used is boiling water reactor is
(A) CO_2
(B) pressurised water
(C) mixture of water and steam
(D) liquid metal

87. Fransis turbine is a
(A) low head
(B) medium head
(C) high head
(D) None of the above

88. The tidal range of tidal power plant is maximum
(A) Gulf of Cambay
(B) Gulf of Kutch
(C) Sunderban area
(D) All of the above

89. Enriched uranium may contain fissionable contents from
(A) 1 to 40 %
(B) 10 – 50 %
(C) 1 – 80 %
(D) 1 – 99 %

90. Maximum wind energy available is proportional to
(A) square of the diameter of rotor
(B) air density
(C) cube of the wind velocity
(D) (A), (B) and (C)

91. In a thermocouple, the potential between the two junctions is due to the temperature gradient along the conductors in the circuit. This effect is named as

(A) Peltier's effect (B) Thomson effect
(C) Seebeck effect (D) Maxwell's effect

92. The maximum allowable limit that a measurement may vary from the true value is known as

(A) Expected error (B) Permissible error
(C) Range of error (D) None of these

93. The voltage of a circuit is measurement by a voltmeter having an input impedance comparable with the output impedance of the circuit thereby causing error in voltage measurement. This error may be called

(A) Gross error
(B) Random error
(C) Error caused by misuse of instrument
(D) Error caused by loading effect.

94. A set of readings has a wide range and therefore it has

(A) low precision (B) high precision
(C) low accuracy (D) high accuracy

95. Laser doppler anemometer is used to measure

(A) pressure (B) velocity
(C) level (surface) (D) density

96. The frequency response can be obtained analytically from the

(A) Characteristic equation (B) Transfer functions of the components
(C) Polar plot (D) Bode diagram

97. In a measurement system, the transducer is

(A) signal-conditioning device (B) input element
(C) output element (D) processing device

98. Thermistors have _____ temperature coefficient.

(A) low and positive (B) high and positive
(C) low and negative (D) high and negative

99. The pressure measuring devices are

(A) Bourdon lube (B) Bellows
(C) Diaphragm (D) All of the above

100. The body absorbs a part of radiation from the walls and reflects the rest.

(A) $\alpha + \rho + \tau = 1$ (B) $\alpha + \tau = 1$
(C) $\alpha + \rho = 1$ (D) $\rho + \tau = 1$

101. Mohr's circle is used to determine the stresses on an oblique section of a body subjected to

(A) direct tensile stress in one plane accompanied by a shear stress
(B) direct tensile stress in two mutually perpendicular directions
(C) direct tensile stress in mutually perpendicular directions accompanied by a simple shear stress
(D) All the above

102. The shear force diagram for a cantilever beam carrying UDL over its length is a

(A) Rectangle (B) Parabola

(C) Triangle (D) Hyperbola

103. The number of elastic constants for a completely anisotropic elastic material which follows Hooke's law is

(A) 3 (B) 4

(C) 21 (D) 25

104. A closed-coil helical spring is subjected to a torque about its axis. The spring wire would experience a

(A) bending stress

(B) direct tensile stress of uniform intensity at its cross-section

(C) direct shear stress

(D) torsional shearing stress

105. Ratio of E/G is given by

(A) $1 + \vartheta$ (B) $2(1 + \vartheta)$

(C) $2(1 - \vartheta)$ (D) $3(1 - 2\vartheta)$

Where,

E = Modulus of Elasticity

G = Modulus of Rigidity

ϑ = Poisson's ratio

106. A thin cylindrical shell of diameter D, wall thickness t, is subjected to internal pressure p. If E and ϑ are Young's modulus and Poisson's ratio of the material, what is volumetric strain in shell ?

(A) $\frac{PD}{2tE}(4 - 5\vartheta)$ (B) $\frac{PD}{4tE}(5 - 4\vartheta)$

(C) $\frac{PD}{4tE}(4 - 5\vartheta)$ (D) None of these

107. Two shaft A and B are made of the same material. The diameter of shaft B is twice that of shaft A. The ratio of power which can be transmitted by shaft A to shaft B.

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$

(C) $\frac{1}{8}$ (D) $\frac{1}{16}$

108. Principal stresses at a point in a plane stressed element are

$\sigma_x = \sigma_y = 500$ kg/cm^2

Normal stream on the plane inclined at 45 to x axis will be

(A) 0 (B) 500 kg/cm^2

(C) 707 kg/cm^2 (D) 1000 kg/cm^2

109. A fixed beam is a beam whose end supports are such that the end slopes

(A) are maximum (B) are minimum

(C) are zero (D) none of the above

110. The point of contra-flexure occurs only in
(A) continuous beams (B) cantilever beams
(C) overhanging beams (D) simply supported beams

111. Which of the following statements is correct for Ackermann steering gear for automobiles ?
(A) It has only turning pairs
(B) It is preferred over davis steering gear
(C) It fulfils the fundamental equation of correcting gearing in the Extreme position
(D) All the above

112. In a four bar Mechanism, no of links
(A) 2 (B) 3
(C) 4 (D) 6

113. Which one of the following is an open pair ?
(A) Ball and socket joint (B) Journal bearing
(C) Lead screw and nut (D) Cam and follower

114. The centre of gravity of the coupler link in a 4-bar mechanism would experience
(A) no acceleration (B) only linear acceleration
(C) only angular acceleration (D) both linear and angular accelerations

115. Which of the following is an inversion of single slider crank chain ?
(A) Beam engine (B) Watt's indicator mechanism
(C) Elliptical trammels (D) Whitworth quick return motion mechanism

116. The magnitude of linear velocity of a point B on a link AB relative to point A is
(A) $\omega \cdot AB$ (B) $\omega (AB)^2$
(C) $\omega^2 \cdot AB$ (D) $(\omega . AB)^2$
where,
ω = Angular velocity of the link AB.

117. When a slider moves on a fixed link having curved surface, their instantaneous centre lies
(A) on their point of contact (B) at the centre of curvature
(C) at the centre of circle (D) at the pin joint

118. The size of cam depends upon
(A) base circle (B) pitch circle
(C) prime circle (D) pitch curve

119. A rotary internal combustion engine has _____ cylinders.
(A) four (B) five
(C) six (D) seven

120. The mechanism forms a structure, when the number of degrees of freedom (n) is equal to
(A) 0 (B) 1
(C) 2 (D) –1

121. A pulley in a belt drive acts as a
(A) Sliding pair (B) Rolling pair
(C) Cylindrical pair (D) Wrapping pair

122. Which one of the following is used to drive a gramophone ?
(A) Porter Governor
(B) Hartung Governor
(C) Wilson-Hartnell Governor
(D) Pickering Governor

123. A reed type tachometer uses the principle of
(A) Torsional vibration
(B) Longitudinal vibration
(C) Transverse vibration
(D) Damped free vibration

124. For effective vibration isolation, the natural frequency ω_n of the system must be (ω is the forcing frequency)
(A) $\omega/4$
(B) ω
(C) 4ω
(D) 10ω

125. An imaginary circle which by pure rolling action, gives the same motion as the actual gear, is called
(A) addendum circle
(B) dedendum circle
(C) pitch circle
(D) clearance circle

126. In a clock mechanism, the gear train used to connect minute hand to hour hand, is
(A) epicyclic gear train
(B) reverted gear train
(C) compound gear train
(D) simple gear train

127. Mitre gears are used for
(A) great speed reduction
(B) equal speed
(C) minimum axial thrust
(D) minimum backlash

128. Differential gear in an automobile is a
(A) simple gear train
(B) epicyclic gear train
(C) compound gear train
(D) None

129. The effect of hammer blow in a Locomotive can be reduced by
(A) increasing the speed
(B) using two or three pairs of wheels coupled together
(C) balancing whole of the reciprocating parts
(D) None of the above

130. Torsional vibrations are said to occur when the particles of a body moves
(A) perpendicular to its axis
(B) parallel to its axis
(C) in a circle about its axis
(D) None of these

131. The critical pressure of the journal bearing is
(A) at which oil film breaks down
(B) metal to metal contact begins
(C) minimum operating pressure of the bearings
(D) All the above

132. Which of the following coupling is used to connect shafts having both lateral and angular misalignment ?

(A) Oldham coupling
(B) Bushed pin type coupling
(C) Universal coupling
(D) All the above

133. The most suitable bearing for carrying very heavy loads with slow speed is

(A) hydrodynamic bearing
(B) ball bearing
(C) roller bearing
(D) hydrostatic bearing

134. Which one of the following is true for involute gears ?

(A) Interference is inherently absent.
(B) Variation in centre distance of shafts increases radial force.
(C) A convex flank is always in contact with concave flank.
(D) Pressure angle is constant throughout the teeth engagement.

135. Compared to square threads, V-threads are

(A) stronger
(B) offer more frictional
(C) prevent the nut from slackening
(D) All the above

136. In a knuckle joint; the eye end or fork end is subjected to

(A) crushing and double shear
(B) crushing and single shear
(C) single shear only
(D) double shear only

137. Shaft is subjected to which of the following stresses :

(A) bending
(B) torsional
(C) bending & torsional
(D) None of the above

138. The product of circular pitch and diametral pitch is

(A) π
(B) 2π
(C) $\pi/2$
(D) D/σ

139. In a V-belt drive, the belt makes contact at

(A) bottom of pulley
(B) could make contact anywhere
(C) sides of groove & bottom of pulley
(D) sides of the groove of pulley

140. In a partial journal bearing, the angle of contact of the bearing with the journal is

(A) 120°
(B) 180°
(C) 270°
(D) 360°

141. The centre to centre distance between two helical gears having z_1 and z_2 as the number of teeth, helix angle ψ normal module m is given by

(A) $a = m (z_1 - z_2)/2 \cos \psi$
(B) $a = (z_1 - z_2)/m_2 \cos \psi$
(C) $a = (z_1 - z_2)/2 \cos \psi$
(D) none of the above

142. The face angle of a bevel gear is equal to
(A) pitch angle – dedendum angle
(B) pitch angle – addendum angle
(C) pitch angle + dedendum angle
(D) None of these

143. Which one of the following loadings is considered for design of axles ?
(A) Bending moment only
(B) Twisting moment only
(C) Combined bending moment and torsion
(D) Combined action of bending moment, twisting moment and axial thrust

144. An involute pinion and gear are in mesh. If both have the same size of addendum, then there will be an interference between the
(A) tip of the gear tooth and flank of pinion
(B) tip of the pinion and flank of gear
(C) flanks of both gear and pinion
(D) tips of both gear and pinion

145. In spur gears, the circular from which the involute profile is generated, is called
(A) Pitch circle
(B) Clearance circle
(C) Base circle
(D) Addendum circle

146. Helical gears are used for
(A) external meshing only
(B) either external or internal meshing
(C) internal meshing only
(D) angular meshing

147. In order to withstand resistance to wear, the best profile of gear is
(A) 14½° full depth involute tooth
(B) 20° full depth involute tooth
(C) 20° involute stub tooth
(D) 14½° stub tooth

148. The included angle for the V-belt is usually
(A) 10° – 20°
(B) 20° – 30°
(C) 30° – 40°
(D) 60° – 80°

149. The backlash for spur gear depends upon
(A) module
(B) pitch line velocity
(C) tooth profile
(D) both (A) and (B)

150. Lewis equation in gears is used to find the
(A) tensile stress in bending
(B) shear stress
(C) compressive stress in bending
(D) fatigue stress

151. When the ordering cost is increased to 4 times the EOQ will be increased to
(A) 2 times
(B) 3 times
(C) 8 times
(D) remains same

152. In which operation tool doesn't rotate

(A) Planning (B) Grinding
(C) Drilling (D) Milling

153. A planar differs from shaper in that

(A) Work piece moves in a planer while tool moves in a shaper
(B) During return stroke time taken in a planer is same as that during cutting while in shaper it is less
(C) Job in planer is harder than that in shaper
(D) Job in shaper is larger than that in planer

154. The type of quick return mechanism employed mostly in shaping machines is

(A) DC reversible motor (B) fast and loose pulleys
(C) whitworth motion (D) slotted link mechanism

155. Guideways of lathe beds are hardened by

(A) carburising (B) cyaniding
(C) nitriding (D) flame hardening

156. The angle between the face and the flank of the single point cutting tool is known as

(A) rake angle (B) clearance angle
(C) lip angle (D) paint angle

157. A dynamometer is a device used for the measurement of

(A) chip thickness ratio (B) forces during metal cutting
(C) wear of the cutting tool (D) deflection of the cutting tool

158. Half nut is connected with

(A) milling machines (B) locking device
(C) jigs and fixtures (D) thread cutting on lathe

159. Tool life is most affected by machine

(A) cutting speed (B) tool geometry
(C) feed and depth (D) microstructure of material being cut

160. Thrust force will increase with the increase in

(A) side cutting edge angle
(B) tool nose radius
(C) rake angle
(D) end cutting edge angle

161. Tool core is made of

(A) Copper (B) Aluminium
(C) Titanium (D) Cobalt

162. Grinding wheel is balanced frequently because of

(A) high rpm (B) random wear
(C) uneven wear (D) forewent glazing

163. Included angle of lathe centre is
(A) 30° (B) 60°
(C) 45° (D) 90°

164. In which of the following gear cutting process indexing is required ?
(A) Hobbing (B) Stamping
(C) End milling (D) Broaching

165. Which one of the following is not a mass production method of gears ?
(A) Cutting by milling cutter (B) Cutting by Pinion cutter
(C) Cutting by rack cutter (D) Cutting by hob

166. Consider the following processes for the manufacture of gears :
1. Casting 2. Powder metallurgy
3. Machining from bar stock 4. Closed die forging
The correct sequence in increasing order of bending strength of gear teeth is
(A) 1 – 2 – 3 – 4 (B) 1 – 2 – 4 – 3
(C) 2 – 1 – 4 – 3 (D) 2 – 1 – 3 – 4

167. Which of the following are the rules of programming NC machine tools in APT language ?
(1) Only capital letters are used
(2) A period is placed at the end of each statement.
(3) Inspection of space does not affect the APT word.
Select the correct answer using the codes given below :
(A) (1) and (2) (B) (2) and (3)
(C) (1) and (3) (D) (1) alone

168. The processes of precision grinding of part with loose dust type abrasive is known as
(A) honing (B) buffing
(C) super-finishing (D) lapping

169. Buffing is the operation of
(A) cleaning castings
(B) deposition metal by spraying
(C) broaching in reverse direction
(D) producing luster on metal surface

170. Feed drives in CNC milling machines are provided by
(A) Synchronous motors (B) Induction motors
(C) Stepper motors (D) Servo motors

171. Electron beam welding can be carried out in
(A) open air
(B) a shielding gas environment
(C) a pressurised inert gas chamber
(D) vacuum

172. Cutting force and power involved in a machine tool can be measured by using
(A) Comparator (B) Transducer
(C) Dynamometer (D) Pyrometer

173. NC machine tool is operated by
(A) feed back system (B) O/P and I/P modules
(C) a series of coded instructions (D) digitising

174. In electro discharge machining process
(A) Very high voltage of the order of kilovolts is applied across electrons.
(B) Current of the order of 10000 amps is passed through the work.
(C) Continuos sparks to erode the metal are produced.
(D) Up to around 2,50,000 sparks per second are produced.

175. Which of the following is not a Gear errors ?
(A) Eccentricity (B) Runout
(C) Wobble (D) Clearance

176. The chart which gives an estimate about the amount of materials handling between various workstations is known as
(A) Flow chart (B) Process chart
(C) Travel chart (D) Operation Chart

177. Which of the following errors are regularly repetitive in nature ?
(A) Systematic errors (B) random errors
(C) controllable errors (D) avoidable errors

178. Auto-collimator is used for measurement of
(A) small angular differences (B) flatness
(C) linear surfaces (D) concavity

179. The diameter of very large bores can be measured accurately by
(A) flexible graduated tape (B) cylindrical gauge
(C) keilpart gauge (D) swinging a pin gauge in the bore

180. The advantage of vernier calliper over micrometer is that it
(A) is easier and quicker to use
(B) is more accurate
(C) can be used to make both inside and outside measurement over a range of sizes.
(D) All of the above

181. A ring gauge is used to
(A) check the diameter of shafts of studs
(B) test the accuracies of holes
(C) check the clearance between two mating surfaces
(D) All of the above

182. A basic hob is one whose
(A) lower deviation is zero
(B) upper deviation is zero
(C) lower and upper deviation are zero
(D) none of these

183. The best size wire for ISO metric thread for measuring pitch diameter of screw thread in terms of its pitch 'P' is
(A) 0.5 P (B) 0.6 P
(C) 0.75 P (D) 0.5773 P

184. Polygon in metrology are concerned with
(A) method of circular dividing
(B) testing of circularity
(C) linear measurements
(D) testing of parallelism

185. The sine bar is specified by
(A) the centre distance between tow rollers
(B) total length
(C) size of the rollers
(D) distance between rollers & upper surfaces

186. The M and E system in metrology are related with measurement of
(A) gears (B) screw threads
(C) angularity (D) surface finish

187. Pick out a feature not related to process or functional layout :
(A) Automatic Material Handling
(B) Better utilization of available equipment
(C) High Flexibility
(D) Better Quality of Product

188. Which one is not affected by a good material handling system ?
(A) Output per unit area (B) Non-productive item
(C) Labour relations (D) Time required for an operation

189. Interchangeability can be achieved by
(A) Standardisation (B) Better process planning
(C) Simplification (D) Better product planning

190. Production scheduling is simpler, and high volume of output and high labour efficiency are achieved in the case of
(A) fixed position layout
(B) process layout
(C) product layout
(D) a combination of line & process layout

191. For moving materials in varying path, the material handling equipment that is not suitable is
(A) crane
(B) conveyor
(C) truck
(D) hand trolley

192. For a product layout the material handling equipment must
(A) have full flexibility.
(B) employ conveyor belts, trucks, tractors etc.
(C) be a general purpose for a particular application
(D) be designed as special purpose for a particular application.

193. The process layout is best suited where
(A) specialisation exists
(B) machines are arranged according to sequence of operation
(C) few number of non-standardised units are to be produced.
(D) mass production is envisaged

194. Earliest finish can be regarded as
(A) EST + duration of activity
(B) EST – duration of activity
(C) LFT – duration of activity
(D) LFT + duration of activity

195. _____ activities are the activities for which total float is equal to zero.
(A) Dummy
(B) Supercritical
(C) Critical
(D) Subcritical

196. In ABC analysis the C items are those which represents
(A) small percentage of the total annual consumption value
(B) high percentage of closing inventory value
(C) high percentage of total annual consumption value
(D) small percentage of closing inventory value

197. Which of the following is not a Human Relation skill ?
(A) Communicating skill
(B) Motivating skill
(C) Decision making skill
(D) Leadership skill

198. Managerial grid implies
(A) Technical team
(B) Worker empowerment
(C) Leadership styles
(D) Job satisfaction

199. Who developed Hierarchy of Needs in Motivation ?
(A) Maslow
(B) Gantt
(C) Frederick Herzberg
(D) Lyman.W

200. Which of the following is not the characteristics of a good management system ?
(A) It should remove weak links of the production chains.
(B) It should properly organise the production activities.
(C) it should care more about production than productivity.
(D) it should properly organise the man power available.