Sl. No. : 500189

MEPE

Register Number | | | | | | | | |

2013
MECHANICAL & 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.

□

1. Mach number is the square root of the ratio of Inertia force to
   (A) Viscous force (B) Elastic force
   (C) Pressure force (D) Gravity force

2. Chezy's Formula is given as
   C - Chezy constant
   m – Hydraulic mean depth
   I – Loss of lead per unit length of pipe
   V – Velocity of flow
   (A) $V = i\sqrt{mC}$ (B) $V = C\sqrt{mi}$
   (C) $V = m\sqrt{Ci}$ (D) $V = C/\sqrt{mi}$

3. The unit speed of pump
   (A) N/H (B) $\frac{\sqrt{H}}{N}$ (C) $\frac{N}{\sqrt{H}}$ (D) $\frac{Q}{\sqrt{H}}$

4. The energy equation for turbomachines whose change in potential energy is negligible is
   (A) $h_1 + \frac{1}{2}C_1^2 = h_2 + \frac{1}{2}C_2^2 + W_s$ (B) $(h_1 - h_2) + Ws = \frac{C_2^2 - C_1^2}{2}$
   (C) $(h_2 - h_1) = \left(\frac{C_2^2 - C_1^2}{2}\right) + W_s$ (D) $W_s = (h_1 - h_2)$

5. A closely coiled helical spring carries an axial pull of 200 N is deflected the spring to 40 mm. The strain energy stored in the spring is
   (A) 400 N–mm (B) 4000 N–mm
   (C) 5 N–mm (D) 50 N–mm

6. The ratio of the maximum displacement of the forced vibration to the deflection due to the static force, is known as
   (A) damping factor (B) damping coefficient
   (C) logarithmic decrement (D) magnification factor

7. The workdone factor for an axial compressor varies from
   (A) 0.5 to 0.75 (B) 0.6 to 0.8
   (C) 0.82 to 0.73 (D) 0.98 to 0.85

8. Absolute Velocity Vector =
   (A) Peripheral Velocity Vector + Relative Velocity Vector
   (B) Relative Velocity Vector
   (C) Axial Velocity Vector
   (D) Peripheral Velocity Vector

9. The static pressure rise in a centrifugal compressor occurs in
   (A) Impeller and diffuser (B) Diffuser and volute
   (C) Impeller and volute (D) Impeller, diffuser and the volute

10. Ammonia is used in Aqua – ammonia system because it is
   (A) Vigorously absorbed in water (B) Low cost
   (C) Toxic (D) Low ODP

11. The ratio of partial pressure of water vapour in the mixture to the saturation pressure of pure water at same temperature of the mixture
   (A) Specific Humidity (B) Degree of Saturation
   (C) Relative Humidity (D) Humidity Ratio

12. In a locomotive, the ratio of the connecting rod length to the crank radius is kept very large in order to
   (A) minimise the effect of primary forces
   (B) minimise the effect of secondary forces
   (C) have perfect balancing
   (D) start the locomotive quickly

13. The efficiency of a screw jack is given by
   where
   α = Helix angle
   ϕ = Angle of friction
   (A) $\frac{\tan(\alpha + \phi)}{\tan \alpha}$ (B) $\frac{\tan \alpha}{\tan(\alpha + \phi)}$ (C) $\frac{\tan(\alpha - \phi)}{\tan \alpha}$ (D) $\frac{\tan \alpha}{\tan(\alpha - \phi)}$

14. The frictional torque transmitted by a cone clutch is same as that of
   (A) flat pivot bearing (B) flat collar bearing
   (C) conical pivot bearing (D) trapezoidal pivot bearing

15. Two close coiled helical springs with stiffness K_1 & K_2 respectively are connected in series. The stiffness in equivalent spring is given by
   (A) $\frac{K_1 K_2}{K_1 + K_2}$ (B) $\frac{K_1 - K_2}{K_1 + K_2}$ (C) $\frac{K_1 + K_2}{K_1 K_2}$ (D) $\frac{K_1 - K_2}{K_1 K_2}$

16. The floating body will be in unstable equilibrium
   (A) when its metacentric height is zero.
   (B) when the metacentre is above centre of gravity.
   (C) when the metacentre is below centre of gravity.
   (D) when the metacentre is at centre of gravity.

17. Laminar flow changes to Turbulent flow when
   (A) Diameter of pipe is decreased (B) Velocity is increased
   (C) Viscosity of fluid is increased (D) Velocity is decreased

18. The resilience of a bolt may be increased by
(A) increasing its shank diameter
(B) increasing its length
(C) decreasing its shank diameter
(D) decreasing its length

19. Reynolds number is the ratio of Inertia force to
(A) Pressure force
(B) Elastic force
(C) Gravity force
(D) Viscous force

20. The frictional torque transmitted by a disc or plate clutch is same as that of
(A) flat pivot bearing
(B) flat collar bearing
(C) conical pivot bearing
(D) trapezoidal pivot bearing

21. The maximum length of arc of contact for two mating gears, in order to avoid interference is where
r = pitch circle radius of pinion
R = pitch circle radius of driver and
ϕ = pressure angle
(A) $(r + R) \sin \phi$
(B) $(r + R) \sec \phi$
(C) $(r + R) \cos \phi$
(D) $(r + R) \tan \phi$

22. The train value of a gear train is
(A) equal to velocity ratio of a gear train
(B) reciprocal of velocity ratio of a gear train
(C) always greater than unity
(D) always less than unity

23. The maximum amount by which the result differs from the true value is called
(A) accuracy
(B) correction
(C) precision
(D) discrepancy

24. When a shaft rotates in anticlockwise direction at slow speed in a bearing, then it will
(A) move towards upward of the bearing making metal to metal contact.
(B) move towards right of the bearing making metal to metal contact.
(C) move towards left of the bearing making metal to metal contact.
(D) move towards downwards of the bearing making metal to metal contact.

25. The size of shaper is specified by
(A) Length of stroke
(B) Height of table
(C) Maximum size of tool
(D) Ratio of forward to return stroke

26. Millimeter scale in a micrometer is marked on
(A) anvil
(B) barrel
(C) thimble
(D) spindle

27. Eden – Rolt comparator is a popular instrument for calibration of
(A) slip gauges (B) vernier
(C) micrometer (D) sine bar

28. The steady flow energy equation of a perfect gas flowing through a nozzle with the initial and final velocities of V_1 and V_2 are given by
(A) $h_1 = h_2$ (B) $h_1 - h_2 = \frac{V_2^2 - V_1^2}{2}$
(C) $h_1 - h_2 = \frac{V_1^2 - V_2^2}{2}$ (D) $h_1 - h_2 = \frac{W_x}{m}$

29. A mixture of gas expands at constant pressure from 1 MPa, 0.03 m^3 to 0.06 m^3 with 84 KJ positive heat transfer. What is the value of change in internal energy ?
(A) 54 KJ (B) 54 KW (C) 114 KJ (D) –54 KJ

30. A pair of helical gear number of teeth in pinion is 80 and number of teeth in gear is 320. The ratio factor is
(A) 2 (B) 1.6 (C) 1 (D) 2.6

31. In lathe, which work holding device is used, if the job is complex and irregular shape, which is inconvenient (or) even impossible to clamp/hold in chucks.
(A) Collets (B) Mandrels
(C) Lathe dogs (D) Face plate

32. The helix angle for single helical gears ranges from
(A) 5° to 10° (B) 10° to 15° (C) 20° to 35° (D) 50° to 60°

33. Work done for an isothermal process is
(A) $\frac{P_1V_1 - P_2V_2}{n-1}$ (B) $P(V_2 - V_1)$
(C) $P_1V_1 \ln(P_1/P_2)$ (D) $P_1V_1 \ln(V_1/V_2)$

34. A taper rin of length 90 mm, has a taper length of 42 mm. The larger diameter of taper is 73 mm and the smaller diameter is 63 mm. Determine the tail-stock setting over.
(A) 10.51 mm (B) 10.61 mm (C) 10.71 mm (D) 10.81 mm

35. For same compression ratio and heat rejection, the thermal efficiency of Otto cycle is
(A) less than diesel cycle (B) greater than diesel cycle
(C) same as that of diesel cycle (D) unpredictable

36. To design 12 speed gear box, the minimum number of intermediate shaft is
(A) 3 (B) 2 (C) 1 (D) 4

37. Mechanical efficiency of a diesel engine is defined as

(A) $\frac{\text{Indicative Horse Power}}{\text{Brake Horse Power}}$

(B) $\frac{\text{Brake Horse Power}}{\text{Indicative Horse Power}}$

(C) $\frac{\text{Brake Horse Power}}{\text{Fuel Input Power}}$

(D) Brake Horse Power × Indicative Horse Power

38. Which statement is wrong, while providing the crown in the pulley ?

(A) The crown on pulley helps to hold the belt on pulley in running condition.

(B) The crown on pulley helps the belt from running off the pulley.

(C) The crown on pulley helps to maintain the speed.

(D) The crown on pulley helps the belt to running equilibrium position near the mid plane of the pulley.

39. A vertical bar chart of a frequency distribution is known as

(A) Poisson distribution (B) Regression analysis

(C) Discrete distribution (D) Histogram

40. What is the term used in gear arrangement to define the amount by which tooth space exceeds the thickness on an engaging tooth ?

(A) Lead (B) Backlash

(C) Run out (D) Pitch Error

41. A motor running at 1200 rpm drives a compressor at 800 rpm through bevel gear arrangement. The pinion has 30 teeth and the number of teeth in the gear is

(A) 18 teeth (B) 45 teeth (C) 48 teeth (D) 24 teeth

42. Which of the following is not a basic form of slip gauges ?

(A) Rectangular (B) Square with centre hole

(C) Circular with square hole (D) Square without centre hole

43. The normal lead, in a worm having multiple start threads, is given by

(A) $l_N = l/\cos \lambda$ (B) $l_N = l . \cos \lambda$

(C) $l_N = l$ (D) $l_N = l \tan \lambda$

44. Sine bars inherently become increasingly impractical and inaccurate as the angle exceeds

(A) 15° (B) 30° (C) 60° (D) 45°

45. The progression ratio of the gear box is

(A) $\frac{N_{min}}{N_{max}} = \phi^n$ (B) $\frac{N_{min}}{N_{max}} = \phi^{n-1}$

(C) $\frac{N_{max}}{N_{min}} = \phi^{n-1}$ (D) $\frac{N_{max}}{N_{min}} = \phi$

46. Which one of the following is not a direct surface roughness measuring instrument ?
(A) Tomlinson Surface meter (B) Taylor-Hobson Talysurf
(C) Wallace Surface Dynamometer (D) Profilometer

47. Which cross-section of the arms is used in cast iron pulley for more efficiency ?
(A) I Section (B) Square Section
(C) Circular Section (D) Elliptical Section

48. Taper parallel method and Rollers method are conveniently used to measure
(A) Major diameter of External Thread (B) Minor diameter of External Thread
(C) Major diameter of Internal Thread (D) Minor diameter of Internal Thread

49. Sensitiveness of a water turbine governor is defined as
(A) $\frac{\text{Mean Speed}}{\text{Maximum Speed} - \text{Minimum Speed}}$
(B) $\frac{\text{Maximum Speed} - \text{Minimum Speed}}{\text{Mean Speed}}$
(C) Mean Speed × Maximum Speed – Minimum Speed
(D) $\frac{\text{Maximum Speed}}{\text{Mean Speed}}$

50. Pelton turbine is suitable for
(A) High head, High discharge (B) Low head, High discharge
(C) Low head, Low discharge (D) High head, Low discharge

51. Which parameter is not required while selecting the flat belt ?
(A) Power to be transmitted
(B) The input and output speeds
(C) The centre distance depending on the space
(D) Semicone angle

52. The permissible maximum concentration of SO_2 at ground level are
(A) 0.05 to 0.08 ppm for 24 Hrs (B) 0.07 to 0.09 ppm for 1 Hr
(C) 0.15 to 0.2 ppm for 24 Hrs (D) 0.08 to 1.15 ppm for 1 Hr

53. The minimum number of teeth on the pinion, in order to avoid interference for $14\frac{1}{2}$ full depth system is
(A) 12 (B) 14 (C) 18 (D) 32

54. The degree of collection for a given ash collector in which 75 kg/s of ash is entering and 25 kg/s of ash leaving is
(A) 0.67 (B) 0.75 (C) 0.52 (D) 0.93

55. The behaviour between the time that the input value changes and the time that the value given by the transducer settles down to the steady state value is known as
(A) Static Characteristics (B) Design Characteristics
(C) Steady State Characteristics (D) Dynamic Characteristics

56. Clinometer is an instrument concerned with
(A) Temperature measurement (B) Roundness measurement
(C) Angular measurement (D) Linear measurement

57. In order for a transportation matrix which has six rows and four colomns not to degenerate, what is the number occupied cells in the matrix ?
(A) 6 (B) 7 (C) 8 (D) 9

58. Routing in production planning and control refers to
(A) sequence of operations to be performed
(B) balancing of load on machines
(C) authorization of work to be performed
(D) progress of operation to be performed

59. Economic order quantity is the quantity at which the cost of carrying is
(A) minimum (B) cost of overstocking
(C) less than the cost of ordering (D) equal to the cost of ordering

60. The failure rate of a temperature measurement system used in a factory A, B, C and D are 0.1, 0.2, 0.3, 0.4 per year respectively. Which one of the above function has reliable measurement system ?
(A) D (B) C (C) A (D) B

61. An analogue ammeter has a linear scale of 50 divisions, its full scale reading is 10 A and a half a scale division can be read. What is the resolution of the instrument ?
(A) 0.1 A (B) 0.2 A (C) 0.25 A (D) 0.3 A

62. The dead zone in a pyrometer is 0.125 % of the span, the instrument is calibrated from 1800° C. What temperature change must occur before it can be detected ?
(A) 2.5 °C (B) 1.25 °C (C) 3 °C (D) 4 °C

63. The error committed by a person in the measurement are
(A) Gross Errors (B) Random Errors
(C) Instrumental Errors (D) Environmental Errors

64. In production planning and control, the document which authorises the start of an operation on the shop floor is
(A) despatch order (B) route plan
(C) loading chart (D) schedule

65. During manufacture of cement, the handling of lime stone is done by
(A) bucket conveyor (B) belt conveyor
(C) overhead crane (D) fork lift machine

66. Greater flexibility in the context of work distribution to machines and workers is achieved in
(A) process layout (B) cellular layout
(C) mixed layout (D) fixed position layout

67. MTM (method-time-measurement) is a work measurement technique by
(A) past data comparison (B) pre-determined motion time and system
(C) stop watch study (D) work sampling study

68. Percent idle time for men and machine is found by
(A) Time study (B) ABC analysis
(C) Analytical estimation (D) Activity sampling

69. Potentiometer sensors are used to measure
(A) Temperature (B) Pressure
(C) Displacement (D) Liquid level

70. The change that occur in the output of the sensor when there is no input, is known as
(A) Drift (B) Zero Drift
(C) Negative Response (D) Positive Response

71. A thermocouple circuit can have other metals in the circuit and they will have no effect on the thermoelectric e.m.f. provided all the junctions are at the same temperature, this is known as
(A) Law of intermediate temperature
(B) Law of intermediate thermocouple
(C) Law of intermediate metals
(D) Law of temperature difference

72. Which method is not there to analysing the trusses ?
(A) Graphical Method (B) Analytical Method
(C) Method of Joints (D) Method of Sections

73. Principle of conservation of momentum is
(A) the initial momentum is greater than final momentum.
(B) the initial momentum is equal to final momentum.
(C) the initial momentum is smaller than final momentum.
(D) the initial momentum is equal to zero.

74. The separation of flow from the blade surface
(A) Surging (B) Priming (C) Stalling (D) Governing

75. The velocity ratio of a fluid whose velocity is 330 m/s and blade velocity is 150 m/s
(A) 1 (B) 2.2 (C) 0.45 (D) 1.5

76. The excess temperature ΔTe
T_s – Surface temperature
T_{sat} – Saturation temperature
T_{sup} – Super heated
(A) T_{sup} (B) $(T_s + T_{sat})$
(C) $(T_{sup} - T_{sat})$ (D) $(T_s - T_{sat})$

77. The value of wavelength for maximum emissive power is given by
(A) Wien's Displacement Law (B) Fourier Law
(C) Planck's Distribution Law (D) Kirchhoff's Law

78. Depending on the radiation properties, a body will be opaque when,
(A) $\tau = 1 ; \rho = \alpha = 0$ (B) $\alpha = 0 ; (\tau + \rho) = 1$
(C) $\tau = 0 ; (\alpha + \rho) = 1$ (D) $\rho = 0 ; (\tau + \alpha) = 1$

79. The main characteristic feature of Air Refrigeration System is
(A) High COP
(B) throughout the cycle the refrigerant remains in gaseous state
(C) Weight of air circulate is less
(D) High Refrigerating cost

80. The process of cooling the liquid refrigerant below the condensing temperature
(A) Supercooling (B) Sub-cooling
(C) Condensation (D) Saturation

81. Relative COP is
(A) $\frac{\text{Theoritical COP}}{\text{Actual COP}}$ (B) Actual COP × Theoritical COP
(C) $\frac{\text{Actual COP}}{\text{Theoritical COP}}$ (D) COP × Refrigerating Effect

82. In refrigeration, if the vapour is not superheater after compression it is
(A) Dry Compression (B) Wet Compression
(C) Superheated Compression (D) Saturated Compression

83. Chloro-fluorocarbons are banned due to
(A) High cost
(B) Toxicity
(C) High Boiling Point
(D) Preventing Infrared rays to escape and allowing UV rays to Earth

84. Which of the following layout is used in ship building industries ?
(A) Line layout
(B) Process layout
(C) Fixed layout
(D) Celluler layout

85. Pilot study showed the percentage of occurrence of an activity as 60%. Determine the number of observations for 95% confidence level and an accuracy of ± 2%
(A) 2,400 Observations
(B) 2,500 Observations
(C) 2,600 Observations
(D) 2,700 Observations

86. Which of the following is not a natural abrasive ?
(A) Garnet
(B) Emery
(C) Carborundum
(D) Diamond

87. Buffing is the operation of
(A) Cleaning the casting
(B) Producing smooth surface
(C) Depositing metal by spraying
(D) Broaching in reverse direction

88. In EDM, the material of the tool is
(A) Diamond
(B) High Speed Steel
(C) Copper
(D) Tungsten Carbide

89. In electro chemical machining, the metal is removed by
(A) dissolution
(B) evaporation
(C) sputtering
(D) shearing

90. The name Carborundum refers to
(A) Silicon Carbide
(B) Silicon Oxide
(C) Silicon Nitrate
(D) Silicon Acid

91. Which statement is wrong in wedge friction ?
(A) To lift heavy block through small distances.
(B) To lift heavy block through large force.
(C) To slightly slide one end of the beam relative to another end.
(D) Weight of wedge is neglected compared to weight to be lifted.

92. Moment of Inertia about the centroidal axis of elliptical quadrant of base 'a' and height 'b' is
(A) $\frac{\pi ab}{24}(a^2 + b^2)$
(B) $\frac{\pi ab}{24}(a^3 + b^3)$
(C) $\frac{\pi ab}{16}(a^2 + b^2)$
(D) $\frac{\pi ab}{16}(a^3 + b^3)$

93. A certain gas has Cp value of 1968 J/kg K and C_v value of 1507 J/kg K. The value of R is
(A) 0.461 KJ/kg K (B) 1307 J/kg K
(C) 1 (D) 461 KJ/kg K

94. The area under T-S diagram represents
(A) Work transfer (B) Temperature
(C) Entropy (D) Heat transfer

95. When the grinding wheels loose their geometry, the original shape is restored by
(A) burnising (B) truing
(C) buffing (D) honing

96. The gear is manufactured on generating principle in
(A) milling (B) hobbing
(C) forming (D) broaching

97. Gear shaving is the operation pertaining to
(A) Gear cutting (B) Gear tooth cutting
(C) Gear finishing (D) Gear tooth correction

98. In abrasive jet machining, metal removal takes place due to
(A) evaporation (B) erosion
(C) corrosion (D) melting

99. The machining process which needs vacuum for its operation is
(A) Electron beam machining
(B) Electrical discharge machining
(C) Electro chemical machining
(D) Plasma machining

100. Personality tests used to find out the candidate's
(A) mental capacity (B) speed of thought
(C) leadership potential (D) discover interest

101. The transverse fillet welded joint is designed for
(A) Tensile strength (B) Compressive strength
(C) Bending strength (D) Shear strength

102. The objective of caulking in a riveted joint is to make the joint
(A) Free from corrosion (B) Stronger in tension
(C) Free from stresses (D) Leak proof

103. The linear velocity of the reciprocating roller follower when it has contact with the straight flank of the tangent cam, is given by

(A) $\omega(r_1 - r_2) \sin\theta$ (B) $\omega(r_1 - r_2) \cos\theta$

(C) $\omega(r_1 + r_2) \sin\theta \sec^2\theta$ (D) $\omega(r_1 + r_2) \cos\theta \operatorname{cosec}^2\theta$

104. A uniform taper rod of diameter 30 mm to 15 mm, length of 314 mm is subjected to 4500 N. The Young's modulus of the material is 2×10^5 N/mm^2. Extension of the bar is

(A) 0.05 mm (B) 0.5 mm (C) 0.25 mm (D) 0.005 mm

105. The person who focuses on innovation and creativity and who transforms an idea into a profitable venture by operating within the organizational environment is called

(A) Intrapreneur (B) Entrepreneur

(C) Business man (D) Venture capitalist

106. Policies in the management is used for

(A) Decision making (B) Allocation of resources

(C) Man power management (D) Budgeting

107. The ratio of $\frac{P_v}{R_T}$ is

(A) Equations of state (B) Compressibility factor

(C) Reduced properties (D) Critical compressibility factor

108. A blower handles 1 kg/s of air at 20 °C and consumes 10 kW of power. If the inlet and exit velocities are 100 m/s and 50 m/s respectively and the specific heat is 1 kJ/kg K, the exit temperature is

(A) 299.25 K (B) 306.75 K (C) 299.75 K (D) 279.25 K

109. Efficiency of Diesel Cycle depends on

(A) Compression ratio

(B) Compression ratio and cut off ratio

(C) Cut off ratio

(D) Cut off and pressure ratio

110. The Management by Objectives (MBO) involves

(A) setting the goals at workers level

(B) setting the goals at engineers level

(C) setting the goals at all the levels of organization

(D) setting the goals at manager's level

111. The budget in which the goals and programs are started from the scratch is

(A) Zero base budget (B) Variable budget

(C) Flexible budget (D) Program budget

112. Equal Pay Act (1963) states that
(A) Equal pay of equal work regardless of sex
(B) Equal pay of equal work based on sex
(C) Equal pay based on races, colours, religions, sex
(D) Pay based on origin

113. The 'Scalar Principles' in organization is
(A) The flow of authority from top to bottom.
(B) The flow of suggestion from bottom to top.
(C) Functional organization
(D) Flow of instructions, informations to horizontal level.

114. Which of the following is called Siamese Twins of management ?
(A) Planning and Organizing
(B) Planning and Controlling
(C) Planning and Staffing
(D) Planning and Leading

115. Who was referred as "The Father of the Social System Approach" in management ?
(A) Vilfredo Pareto (B) Elton Mayo
(C) Frederick W. Taylor (D) Henry Fayol

116. The equation for relationship between $\frac{1}{m}$, C & K is,
(A) $\frac{1}{m} = \frac{3K - 2C}{6K + 2C}$ (B) $\frac{1}{m} = \frac{2C - 3K}{2C + 6K}$
(C) $\frac{1}{m} = \frac{2K - 3C}{2C + 6K}$ (D) $\frac{1}{m} = \frac{3K + 2C}{6K - 2C}$

117. The equation for relationship between E, G & K is
(A) $E = \frac{3\,KG}{K + 9G}$ (B) $E = \frac{3\,KG}{9K + G}$
(C) $E = \frac{9\,KG}{K + 3G}$ (D) $E = \frac{9\,KG}{3K + G}$

118. The section modulus of rectangular section is
(A) $\frac{bd^3}{12}$ (B) $\frac{bd^2}{12}$ (C) $\frac{bd^2}{6}$ (D) $\frac{bd^3}{6}$

119. A pipe of diameter 800 mm contains fluid under a pressure of 2 N/mm^2. If the tensile strength is 100 N/mm^2, the thickness of the pipe is
(A) 16 mm (B) 4 mm (C) 8 mm (D) 10 mm

120. Single riveted lap joint for 8 mm thick plates with 8.5 mm diameter rivets at a pitch of 50 mm. The stress in the plate is 110 N/mm^2. The tearing strength per pitch is

(A) 36.52×10^3 N (B) 7.48×10^3 N
(C) 37.84×10^3 N (D) 35.2×10^3 N

121. Poisson's ratio is

(A) longitudinal strain / lateral strain (B) shear strain / lateral strain
(C) lateral strain / shear strain (D) lateral strain / longitudinal strain

122. Democratic Leader

(A) give rewards and punishment.
(B) consults with subordinates on proposed actions and decisions.
(C) gives subordinates a high degree of independence in their operations.
(D) depend largely on subordinates.

123. For achieving the cooling effect by Joule-Kelvin, expansion the initial temperature of gas must be below the

(A) Boiling point temperature (B) Freezing point temperature
(C) Maximum inversion temperature (D) Saturation temperature

124. A venturimeter is generally used to measure the rate of flow of

(A) Air (B) Steam (C) Water (D) Hydrogen

125. Multi-stage reaction turbines employ

(A) with large pressure drop (B) with lower pressure drop
(C) constant pressure drop (D) with high rotational speed

126. The entire change in the static properties occur in the rotor implies

(A) zero degree reaction (B) hundred percent degree of reaction
(C) degree of reaction (D) negative degree of reaction

127. The heat carried away by coolant is called as

(A) Unaccounted Loss (B) Dead Loss
(C) Minor Loss (D) Major Loss

128. Flow in a constant area duct with heat transfer is

(A) Rayleigh flow (B) Isentropic flow
(C) Fanno flow (D) Reversible flow

129. Running cost of the hydroelectric power plant is

(A) more than the running cost of steam power plant.
(B) less than the running cost of the steam power plant.
(C) equal to running cost of the steam power plant.
(D) equal to running cost of the nuclear power plant.

130. The minimum wind speed at which the machine will deliver useful power is known as
(A) Rated wind speed (B) Cut out speed
(C) Cut-in speed (D) Average speed

131. The nuclear power plant at Tarapur has
(A) pressurized water reactors (B) boiling water reactor
(C) sodium-graphite reactor (D) pressurized heavy water reactor

132. The boiling water reactor uses
(A) Enriched Uranium as fuel (B) Plutonium
(C) Thorium (D) Lawrensium

133. A point B on a rigid link AB moves with respect to A with angular velocity ω rad./s. The total acceleration of B with respect to A will be equal to
(A) vector sum of radial component and cariolis component.
(B) vector sum of tangential component and cariolis component.
(C) vector sum of radial component and tangential component.
(D) vector difference of radical component and tangential component.

134. When a body of mass moment of Inertia I is rotated about that axis with an angular velocity ω, then the kinetic energy of rotation is
(A) 0.5 I. ω. (B) I. ω. (C) $0.5\ I\ \omega^2$ (D) $I.\ \omega^2$

135. The motion of a piston in the cylinder of a steam engine is an example of
(A) Forced constrained motion
(B) Successfully constrained motion
(C) Incompletely constrained motion
(D) Completely constrained motion

136. When a particle moves along a straight path, then the particle has
(A) normal component of acceleration only
(B) tangential acceleration only
(C) centripetal acceleration only
(D) both tangential and centripetal acceleration

137. Beams with four unknown reaction is
(A) In-Determinate Beams (B) Determinate Beams
(C) Propped Beams (D) Im-Propped Beams

138. The maximum efficiency for square threads for raising the load
(A) $\frac{\sin\phi - 1}{\sin\phi + 1}$ (B) $\frac{\sin\phi + 1}{\sin\phi - 1}$ (C) $\frac{1 - \sin\phi}{1 + \sin\phi}$ (D) $\frac{1 + \sin\phi}{1 - \sin\phi}$

139. Which one of the following is the wrong assumption :

(A) Members of the truss are pin-connected to each other.

(B) Members of the truss are rigid.

(C) Members of the truss are subjected to bending moments.

(D) Members are of uniform cross-section.

140. The particle is projected at point 'O' with initial velocity 'u' inclined at 'α' to x-axis, x-component of initial velocity at point 'O' is

(A) $u_x = u \cdot \sin \alpha$ (B) $u_x = u \cdot \cos \alpha \cdot \sin \alpha$

(C) $u_x = u \cdot \cos \alpha$ (D) $u_x = u \cdot \tan \alpha$

141. The section modulus of hollow circular section is

(A) $\frac{\pi}{16\,D}(D^4 - d^4)$ (B) $\frac{\pi}{32\,D}(D^4 - d^4)$

(C) $\frac{\pi}{32\,D}(D^3 - d^3)$ (D) $\frac{\pi}{16\,D}(D^3 - d^3)$

142. A simply supported beam of span 4 m with hinged support at both the ends. It is carrying the point loads of 10, 20 & 30 kN at 1, 2 & 3 m from left support. The R_A & R_B are

(A) 27.5 kN, 32.5 kN (B) 15 kN, 45 kN

(C) 25 kN, 35 kN (D) 32.5 kN, 27.5 kN

143. A thin spherical shell of 1.5 m diameter is 8 mm thick is filled with a liquid at the pressure of 3.2 N/mm^2. The stress induced in the shell is

(A) 75 N/mm^2 (B) 150 N/mm^2 (C) 200 N/mm^2 (D) 180 N/mm^2

144. A steel ball of weight 0.1 N falls from a height 6 m and rebounds to a height of 4 m. The impulse is

(A) 0.0201 N - S (B) 0.201 N – S

(C) 1.205 N – S (D) 12.05 N – S

145. The brake power of an engine whose mechanical efficiency is 80% and indicated power is 125000 W is

(A) 100 W (B) 10,000 kW (C) 100 kW (D) 125 kW

146. An engine consumes 5 kg/hr of fuel and its brake power is 20 kW. The value of brake specific fuel consumption is

(A) 0.25 kg/kW h (B) 4 kg/kW h

(C) 2 kg/kW h (D) 15 kg/kW h

147. Morse Test is used to determine the performance of

(A) Two stroke engines (B) Multicylinder engines

(C) Four stroke engines (D) Single cylinder engine

148. The process of replacement of combustion products with fresh air charge
(A) Turbocharging (B) Idling
(C) Supercharging (D) Scavenging

149. When a particle moves with a uniform velocity along a circular path, then the particle has
(A) tangential acceleration only (B) normal component of acceleration only
(C) centripetal acceleration only (D) both tangential and centripetal acceleration

150. Which of the following statement is correct :
(A) The kinetic energy of a body during impact remains constant.
(B) The kinetic energy of a body before impact is equal to the kinetic energy of a body after impact.
(C) The kinetic energy of a body before impact is less than the kinetic energy of a body after impact.
(D) The kinetic energy of a body before impact is more than the kinetic energy of a body after impact.

151. The coriolis component of acceleration is taken into account for
(A) Scotch Yoke Mechanism (B) Quick return motion mechanism
(C) Slider crank mechanism (D) Elliptical trammels

152. The rotor of a ship rotates in clockwise direction when viewed from the stern and the ship takes a left turn. The effect of the gyroscopic couple acting on it will be
(A) to raise the bow and stern.
(B) to lower the bow and stern.
(C) to raise the bow and lower the stern.
(D) to lower the bow and raise the stern.

153. In radial drilling machine, large and odd shaped workpieces are hold by using
(A) V-block (B) Machinewise
(C) Strap clamps and T-bolts (D) Three jaw chuck

154. The region where the Mach number is less than unity is
(A) Subsonic (B) Supersonic (C) Sonic (D) Hypersonic

155. Velocity temperature is
(A) $\frac{T_0}{T}$ (B) $\frac{C}{C_p}$ (C) $\frac{C^2}{2C_p}$ (D) $\frac{T}{T_C}$

156. The ratio of stagnation pressure and static pressure
(A) $\left[1+\frac{\nu-1}{2}M^2\right]^{\frac{\nu}{\nu-1}}$ (B) $\left[1+\frac{\nu-1}{2}M^2\right]$
(C) $\left[1+\frac{\nu-1}{2}M^2\right]^{\frac{\nu-1}{\nu}}$ (D) $\sqrt{\nu RT}$

157. Quick return mechanism is not required in
(A) Planner (B) Broaching (C) Slotter (D) Shaper

158. 119 divisions can be indexed by using
(A) differential indexing (B) simple indexing
(C) double indexing (D) direct indexing

159. Increase in compression ratio in CI engines
(A) decreases turbulence (B) increases mechanical efficiency
(C) decreases mechanical efficiency (D) decreases thermal efficiency

160. The purpose of supercharging is to
(A) increase detonation (B) increase the volumetric efficiency
(C) decrease the volumetric efficiency (D) decrease mechanical efficiency

161. The time interval between ignition initiation and the actual start of combustion
(A) Self ignition (B) Ignition delay
(C) Pre-ignition (D) Idling

162. Lubrication system for high capacity engines
(A) Wet Sump Lubrication (B) Mist Lubrication
(C) Splash System (D) Dry Sump Lubrication

163. The Octane number of Iso-octane is
(A) 100 (B) Zero (C) 15 (D) One

164. Prandtly-Meyer relation gives the relationship between
(A) stagnation temperature and initial temperature
(B) density before and after shock
(C) gas velocity before and after shock
(D) velocity fluid and sound

165. A pump lifts 50 m^3 of water to a tank at a height of 50 m. What is the work done to lift the water ?
(A) 24.525 MJ (B) 20.525 MJ (C) 32.525 MJ (D) 18.525 MJ

166. The angle which the oblique shock wave makes with the initial direction of flow is
(A) Mach angle (B) Wave angle
(C) Deviation angle (D) Angle of deflection

167. In which method the gear cutting can be done faster ?
(A) Milling (B) Shaping (C) Hobbing (D) Turning

168. Number of Transfer Units (NTU) is

(A) $\frac{UA}{C_{max}}$ (B) $\frac{C_{min}}{C_{max}}$ (C) $\frac{UA}{C_{min}}$ (D) $1 + \frac{C_{min}}{C_{max}}$

169. The equivalent emissivity of two large parallel gray planes, whose emissivities are 0.2 and 0.5 is

(A) 0.1 (B) 6 (C) 0.4 (D) 2.5

170. At thermal equilibrium, the absorptivity of a body is equal to

(A) Emissivity (B) Reflectivity
(C) Transmissivity (D) Diffusivity

171. The ratio of heat flow $\frac{Q_1}{Q_2}$ from two walls of same thickness having their thermal conductivities $K_1 = 2\ K_2$ will be

(A) 2 (B) 1 (C) 0.5 (D) 0.25

172. Momentum equations are derived from

(A) First Law of Thermodynamics (B) Newton's First Law
(C) Newton's Second Law of Motion (D) Second Law of Thermodynamics

173. In horizontal milling machine, the cutting tool is mounted on

(A) Arbor (B) Spindle (C) Table (D) Column

174. Among the following, for which operation, the slowest speed is selected in lathe ?

(A) Facing (B) Taper Turning
(C) Thread Cutting (D) Straight Turning

175. The engine of an aeroplane rotates in clockwise direction when seen from the tail end and the aeroplane takes a turn to the left. The effect of the gyroscopic couple on the aeroplane will be

(A) to raise the nose and dip the tail (B) to dip the nose and raise the tail
(C) to raise the nose and tail (D) to dip the nose and tail

176. A steel workpiece is to be milled. Metal removal rate is 40 cm^3/min. Depth of cut is 10 mm and width of cut is 200 mm. Find the Table Feed ?

(A) 20 mm/min (B) 30 mm/min (C) 40 mm/min (D) 50 mm/min

177. A plate 100 mm wide and 10 mm thick is to be welded to another plate by means of double parallel fillets. The plates are subjected to a static load of 77 kN. Find the length of weld if the permissible shear in the weld does not exceed 55 MPa.

(A) 100 mm (B) 150 mm (C) 200 mm (D) 250 mm

178. A truck has a mass of 10 tonnes and its initial speed is 1.5 m/s, while the second truck has mass of 15 tonnes with initial speed 1.0 m/s, in the same direction. The common velocity when moving together during impact is

(A) 0.833 m/s (B) 0.12 m/s (C) 1.2 m/s (D) 8.3 m/s

179. In a steam engine, the piston rod is usually connected to the cross head by means of

(A) Cotter Joint (B) Universal Joint
(C) Knuckle Joint (D) Flat Joint

180. The value of $\frac{4f L_{max}}{D}$ for sonic velocity is

(A) Less than one (B) One
(C) Zero (D) Greater than one

181. The velocity of air entering in a rocket is

(A) less compared to an aircraft
(B) zero compared to an aircraft
(C) more compared to an aircraft
(D) same compared to an aircraft

182. Shock waves are

(A) Infinitesimal pressure waves (B) Non-steep pressure waves
(C) Expansion waves (D) Steep pressure waves

183. If 'a' represents accuracy, 'p' represents precision, 'c' represents calibration error, which one of the following expression is right ?

(A) $a = p - c$ (B) $c = p - a$ (C) $p = a + c$ (D) $a = p + c$

184. A spring balance has its deflection measured from number of loads and gave the following results. Determine its sensitivity.

Load in kg → 0, 1, 2, 3, 4

Deflection in mm → 10, 20, 30, 40, 50

(A) 10 mm/kg (B) 15 mm/kg (C) 20 mm/kg (D) 25 mm/kg

185. The working fluid in refrigeration cycle is

(A) Refrigerator (B) Refrigerant
(C) Absorbent (D) Lubricant

186. The difference between Wet Bulb temperature and Dry Bulb Temperature

(A) Wet Bulb Depression (B) Dew Point Temperature
(C) Saturation Temperature (D) Adiabatic Saturation Temperature

187. The COP of a refrigerator which operates on reversed Carnot Cycle whose highest temperature is 27 °C and lower temperature is – 23 °C.
(A) 0.2 (B) 5 (C) 5.75 (D) 6

188. The distance from the surface at which the local velocity reaches 99 percent of the external velocity is
(A) Momentum thickness (B) Free stream velocity
(C) Boundary layer thickness (D) Momentum diffusivity

189. Logarithmic Mean Temperature Difference in case of counter flow compared to parallel flow will be
(A) More (B) Less (C) Equal (D) Unpredictable

190. The maximum force which acts on the connecting rod is
(A) Force due to gas pressure
(B) Force due to inertia of piston
(C) Force due to friction of connecting rod
(D) Force due to crank pin

191. If Z is absolute viscosity of the lubricant, N is the speed of journal and P is bearing pressure, then the bearing characteristic number is
(A) $\frac{ZN}{P}$ (B) $\frac{ZP}{N}$ (C) $\frac{Z}{PN}$ (D) $\frac{P}{ZN}$

192. The total frictional torque for a thrust bearing is given by _____.
Where μ is coefficient of friction, W – load transmitted, R – outer radius of collar and r – inner radius of collar.
(A) $\frac{1}{3}\mu W\left[\frac{R^3-r^3}{R^2-r^2}\right]$ (B) $\mu W\left[\frac{R^3-r^3}{R^2-r^2}\right]$
(C) $2\mu W\left[\frac{R^3-r^3}{R^2-r^2}\right]$ (D) $\frac{2}{3}\mu W\left[\frac{R^3-r^3}{R^2-r^2}\right]$

193. The inside pressure of a hollow bubble of diameter 'd' subjected to surface tension 'σ' is given by
(A) $p=\frac{4\sigma}{d}$ (B) $p=\frac{8\sigma}{d}$ (C) $p=\frac{\sigma}{4d}$ (D) $p=\frac{2\sigma}{d}$

194. Loss of head in the pipe due to various pipe fittings such as valves, coupling is expressed as
(A) $\frac{KV^2}{2g}$ (B) $\frac{V^2}{2g}$ (C) $0.5\frac{V^2}{2g}$ (D) $\frac{V^2}{2kg}$
V – velocity of flow
K = co-efficient of pipe fitting

195. The tank of size 2 m × 2 m × 2 m hold, how much litre of water ?

(A) 8000 litres (B) 6000 litres (C) 4000 litres (D) 2000 litres

196. Type of flow in which the fluid particles while flowing along scream lines, do not rotate about their own axis

(A) Rotational flow (B) Irrotational flow

(C) Non-uniform flow (D) Turbulent flow

197. In a locomotive, the maximum magnitude of the unbalanced force along the perpendicular to the line of stroke is known as

(A) tractive force (B) swaying force

(C) hammer blow (D) primary force

198. Loss of energy due to hydraulic jump ($h\alpha$)

d_1 – depth of flow at section 1 – 1

d_2 – depth of flow at section 2 – 2

(A) $h_\alpha = \dfrac{d_2^3 - d_1^3}{4\, d_1 d_2}$ (B) $h_\alpha = \dfrac{d_2^3 - d_1^3}{8\, d_1 d_2}$

(C) $h_\alpha = \dfrac{(d_2 - d_1)^3}{4\, d_1 d_2}$ (D) $h_\alpha = \dfrac{(d_2 - d_1)^3}{8\, d_1 d_2}$

199. In a screw jack, the effort required to lift the load W is given by

Where α = Helix angle

ϕ = Angle of friction

P = Effort required

(A) $P = W \tan(\alpha - \phi)$ (B) $P = W \tan(\alpha + \phi)$

(C) $P = W \cos(\alpha - \phi)$ (D) $P = W \cos(\alpha + \phi)$

200. The acceleration of the piston in a reciprocating steam engine, neglecting the weight of the connecting rod is given by

where

ω = Angular velocity of the crank

r = Radius of the crank

θ = Angle turned by the crank from inner dead centre

n = Ratio of length of connecting rod to crank radius

(A) $\omega r\left(\cos\theta + \dfrac{\cos 2\theta}{n}\right)$ (B) $\omega^2 r\left(\cos\theta + \dfrac{\cos 2\theta}{n}\right)$

(C) $\omega r\left(\sin\theta + \dfrac{\sin 2\theta}{n}\right)$ (D) $\omega^2 r\left(\sin\theta + \dfrac{\sin 2\theta}{n}\right)$