MPPSC AE

Previous Year Paper
(Mechanical) 3 July 2022

SECTION – A
General Studies

1. The highest peak of Madhya Pradesh is located
   (A) Mahadeo hills
   (B) Kaimur range
   (C) Vindhyachal range
   (D) Bhander range

2. Match List – I with List – II and select the correct answer from the codes given below.

List – I (River)	List – II (River drainage area Town/District)
a. Wainganga	1. Multai
b. Tapti	2. Seoni
c. Narmada	3. Jabalpur
d. Betwa	4. Vidisha

Codes :

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

3. The most important Geographical factor affecting average temperature in Madhya Pradesh
   (A) Proximity to the Bay of Bengal
   (B) Tropic of Cancer passes through the middle of Madhya Pradesh
   (C) About 25 percent part of the land area of Madhya Pradesh is covered by forests
   (D) Proximity to the Equator of the Southern part of Madhya Pradesh

4. Consider the following statement with reference to soils.
   1. Large amount of iron and lime are found in black soil.
   2. Red and yellow soil is found in Baghelkhand.
   3. Alluvial soil is found in Bhind and Morena District.

   Select the correct statement from the above.
   (A) 1, 2 and 3
   (B) 1 and 2
   (C) only 1
   (D) only 2

5. Which of the following pair is **not** correctly matched ?

District	Mining area
(A) Panna	Diamond
(B) Balaghat	Copper
(C) Katni	Limestone
(D) Sagar	Manganese

6. Which Tiger Reserve of Madhya Pradesh has been declared the Biosphere Reserve by UNESCO ?
   (A) Kanha Tiger Reserve
   (B) Pench Tiger Reserve
   (C) Satpuda Tiger Reserve
   (D) Panna Tiger Reserve

7. The two States that have been recently in news for inter-state border dispute are

(A) Mizoram – Meghalaya

(B) Manipur – Meghalaya

(C) Mizoram – Arunachal Pradesh

(D) Mizoram – Assam

8. Match List – I with List – II and using the given codes, select the correct answer.

List – I (Player)	List – II (Sport)
a. Chinki Yadav	1. Horse Riding
b. Akshat Joshi	2. Shooting
c. Muskan Kirar	3. Hockey
d. Khamman Singh	4. Archery

Codes :

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

9. With which sport is "Rajmata Vijya Raje Sindhia Competition" associated ?

(A) Cricket

(B) Hockey

(C) Football

(D) Chess

10. Yogesh Malviya has been awarded the Dronacharya Award – 2020 for which sport ?

(A) Kabaddi

(B) Wrestling

(C) Mallakhamba

(D) Boxing

11. Which of the following is an example of input devices ?

(A) Trackball

(B) Speaker

(C) Printer

(D) Plotter

12. Who is called the 'father of artificial intelligence' ?

(A) V. Rajaraman

(B) Alan Turing

(C) John McCarthy

(D) Tim Berners-Lee

13. The smallest unit of memory in a computer is

(A) Megabyte

(B) Nibble

(C) Byte

(D) Bit

14. E-Pathshala App is related to
(A) Books
(B) Scholarship
(C) Medicine
(D) Farmers

15. Which of the following is an anti-virus software ?
(A) Monkey
(B) Norton
(C) Adware
(D) Trojan Horse

16. It was the Capital of 'Rajabhoj'
(A) Ujjain
(B) Dewas
(C) Dharanagari
(D) Bhopal

17. Who was the last successful and glorious King of Garha Mandala ?
(A) Raja Shah
(B) Vikram Shah
(C) Shankar Shah
(D) Vishnu Shah

18. Who built Sanchi Stupa ?
(A) Chandragupta first
(B) Bimbisara
(C) Bindusara
(D) Ashoka

19. Amritlal Vegad is related to
(A) Sculpture
(B) Painting
(C) Singing
(D) Music

20. Who is the 'Bhilat Baba' ?
(A) The Chief deity of the 'Bharia'
(B) The Chief deity of the 'Bhils'
(C) The Chief deity of the 'Baiga'
(D) The Chief deity of the 'Saharia'

21. Which of the following campaign has been initiated under the "Beti Bachao Beti Padhao" Scheme run by Madhya Pradesh Government ?
(A) Sankh
(B) Lado
(C) Uma
(D) Pankh

22. Under the Madhya Pradesh Mukhyamantri Kisan Kalyan Yojana, how much amount is to be given to beneficiary family in a financial year ?

(A) ₹ 4,000
(B) ₹ 5,000
(C) ₹ 6,000
(D) ₹ 7,000

23. Consider the following statements related to Mission Gramodaya Yojana of Madhya Pradesh Government.

i. Families living in rural areas will be provided with residential facility.
ii. Basic amenities of rural areas will be expanded.
iii. This scheme was inaugurated in the district headquarter of Bhopal.

Choose the correct option :

(A) i and iii
(B) ii and iii
(C) i and ii
(D) All of the above

24. Which award has been given to Prof. Sharad Pagare ?

(A) Saraswati Samman – 2020
(B) Kalidas Samman – 2020
(C) Vyas Samman – 2020
(D) Tansen Samman – 2020

25. Singorgarh fort is situated in which district of Madhya Pradesh ?

(A) Sagar
(B) Damoh
(C) Jabalpur
(D) Chhatarpur

26. Which of the following is not a mobile Operating System ?

(A) Palm OS
(B) Web OS
(C) Symbian OS
(D) Mac OS

27. Which of the following is the core protocol of WWW ?

(A) DSI
(B) HTTP
(C) NNTP
(D) FTP

28. URL stands for

(A) Universal Reference Location
(B) Uniform Resource Locator
(C) Universal Resource Locator
(D) University Resource Locator

29. Which of the following describe E-Commerce ?

(A) Business of Electronic Goods

(B) Business of Electrical Goods

(C) Doing Business Electronically

(D) All of the above

30. Which of the computer language is used in "Artificial Intelligence" ?

(A) JAVA

(B) Pascal

(C) PROLOG

(D) FORTRAN

31. Venganga river flows

(A) Balaghat

(B) Betul

(C) Khandwa

(D) Dindori

32. Chanderi is famous for

(A) Sarees

(B) Wooden work

(C) Bidi industry

(D) Diamond industry

33. 'Matki' dance is famous in which area ?

(A) Malwa

(B) Nimar

(C) Bundelkhand

(D) Bagholkhand

34. In which District is 'chidikho' tourist place located ?

(A) Bhopal

(B) Rajgarh

(C) Raisen

(D) Sehore

35. 'Poet Bihari' was related from

(A) Madhya Pradesh

(B) Bihar

(C) Rajasthan

(D) Uttar Pradesh

36. Which of the following correct order of Ministers from senior to junior in the State Council of Ministers ?

(A) Minister of State, Cabinet Minister, Deputy Minister, Parliamentary Secretary

(B) Cabinet Minister, Deputy Minister, Minister of State, Parliamentary Secretary

(C) Cabinet Minister, Minister of State, Parliamentary Secretary, Deputy Minister

(D) Cabinet Minister, Minister of State, Deputy Minister, Parliamentary Secretary

37. Who was the first leader of opposition of Madhya Pradesh Legislative Assembly ?

(A) Vishnu Vinayak Sarvate

(B) Vishnu Nath Tamashkar

(C) V. G. Ghate

(D) Vishwanath Yadavrao Tamashkar

38. Which of the following body is the highest decision making body in the politico-administrative system according to Indian Constitution ?

(A) Ruling party

(B) Cabinet

(C) Legislative Assembly

(D) Collectively all

39. In which Article of the Indian Constitution there is a provision to constitute Gram Sabha in Gram Panchayat ?

(A) 243 A

(B) 243 B

(C) 243 C

(D) 243 D

40. When Madhya Pradesh was declared as "Open Defection Free" State ?

(A) 16 January 2016

(B) 01 May 2018

(C) 15 August 2016

(D) 02 October 2018

41. By whom is the work of diamond mining done in Panna District ?

(A) National Mineral Development Corporation

(B) Bharat Diamond Bourse

(C) Jindal Sales Corporation

(D) Alrosa

42. Which of the following option is **not** correct ?

(A) The coal found in Madhya Pradesh is deposit in Gondwana rock group

(B) Pench Kanhan coalfield is an important coal mining area in Madhya Pradesh

(C) Singrauli coalfield is spread over Madhya Pradesh and Chhatisgarh

(D) Pathakheda coalfield is situated in Betul district and provides coal to Sarni Thermal Power Station

43. Which coalfield is **not** located in Madhya Pradesh ?

(A) Korba coalfield

(B) Mohpani coalfield

(C) Sohagpur coalfield

(D) Pathakheda coalfield

44. Which of the following pair is **not** correctly matched ?

Irrigation Project	River/ Tributary
(A) Ban Sagar Project	Son
(B) Tawa Project	Tawa
(C) Pench Project	Pench
(D) Kolar Project	Betwa

45. Balaghat District gets irrigation facility from the canal of which river ?

(A) Wainganga
(B) Narmada
(C) Tapti
(D) Matiyari

46. Which of the following tribe is **not** a sub-tribe of "Baiga Tribe" ?

(A) Bijhwar
(B) Narotia
(C) Badoya
(D) Kathmaina

47. The scale of measuring the values of the components of "Physical Quality of Life Index" lies between

(A) In between 0 to 1
(B) In between 1 to 100
(C) In between 1 to 50
(D) In between 0 to 100

48. As per 2011 Census, what is the population density of Madhya Pradesh from the following ?

(A) 225/sq. km.
(B) 236/sq. km.
(C) 246/sq. km.
(D) 382/sq. km.

49. In which district of Madhya Pradesh thickest layer of coal of India is found ?

(A) Chhindwara
(B) Singrauli
(C) Shahdol
(D) Betul

50. How much amount is being provided by the Madhya Pradesh Government under the "Kisan Kalyan Yojana" annually in addition to the amount announced by the Central Government under "Kisan Samman Nidhi Yojana" ?

(A) Rs. 2,000
(B) Rs. 3,000
(C) Rs 4,000
(D) Rs. 5,000

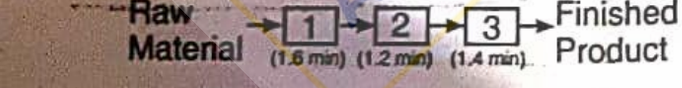
SECTION – B

Mechanical Engineering

51. Little's law is the relationship between
(A) Stock level and lead time in an inventory system
(B) Waiting time and length of the queue in a queuing system
(C) Number of machines and job due dates in a scheduling problem
(D) Uncertainty in the activity time and project completion time

52. A toy manufacturer uses approximately 32,000 silicon chips annually. The chips are used at a steady rate during the 240 days a year that the plant operates. Annual holding cost is $ 3 per chip and ordering cost is $ 120. The optimal order quantity is
(A) 2000 chips
(B) 1200 chips
(C) 1500 chips
(D) 1600 chips

53. A factory has three work centres for a particular product. The centres are in a series as shown. The raw material passes through the work centres successively to produce the product. The time required at each work centre is shown in bracket. The system efficiency is



(A) 85%
(B) 87.5%
(C) 92%
(D) 80%

54. In context to the inventory management, ABC analysis means
(A) Classifying materials according to their consumption value
(B) Classifying materials according to their quality
(C) Classifying materials according to their size and weight
(D) Classifying materials according to their suppliers

55. The process of fixing the sequence of operations and material flow is
(A) Master scheduling
(B) Scheduling
(C) Expediting
(D) Routing

56. The main function of the strainer in the carburetor
(A) To maintain pressure of the fuel
(B) To maintain temperature of the fuel
(C) To prevent possible blockage of the nozzle by dust particles
(D) To prevent access amount of engine oil in the combustion chamber

57. In the exhaust gases of the IC engine, the source of diesel odor is
(A) Hydrocarbon compounds
(B) CO
(C) NO_x
(D) CO_2

58. In the 4 stage steam turbines with pressure compounding the total isentropic enthalpy drop of steam

(A) Remain constant for all 4-stages
(B) Is maximum at the last stage
(C) Is divided equally among the 4-stages
(D) Is maximum at the first stage

59. Maximum air required per kg of fuel for complete combustion can be given by (considering mass fraction being C, H, O and S of respective constituent)

(A) $\frac{1}{21}\left[\frac{8}{3}C + 8\left(H - \frac{O}{8}\right) + S\right]$

(B) $\frac{1}{23}\left[\frac{8}{3}C + 8\left(H - \frac{O}{8}\right) + S\right]$

(C) $\frac{1}{23}\left[8C + 8\left(H - \frac{O}{8}\right) + S\right]$

(D) None of the above

60. A combustion has all the oxygen supplied with air to the reactants being used and no free oxygen appears in the product, such air supplied is called as

(A) Excess air
(B) Dry air
(C) Stoichiometric air
(D) None of the above

61. In CNC programming cutter radius compensation is set with

(A) G02
(B) G42
(C) G28
(D) G03

62. The lost motion in CNC machine tool is an account of

(A) Wind up of drive shafts
(B) Deflection of machine tool members
(C) Backlash in gearing
(D) None of the above

63. Flexible Manufacturing Systems (FMS) incorporate automation concepts such as

(A) CNC machines, group technology and automatic material handling between machines
(B) Computer control over the materials handling systems, direct numerical machine tools, group technology and CNC machines
(C) Equipment maintenance and repair, tool changing and tool setting
(D) Above (A) and (B)

64. Which feedback device translate physical motion in to electrical data ?

(A) Transducer
(B) Encoder
(C) Digital system monitoring
(D) None of the above

65. The interpolation in a CNC machine tool controls

(A) Feed rate
(B) Spindle speed
(C) Tool change
(D) Coolant flow

66. The Otto cycle is an air standard cycle of spark ignition engine. The sequence of first four processes of the engine is

(A) Intake, Expansion, Combustion, Compression

(B) Intake, Combustion, Compression, Expansion

(C) Intake, Compression, Combustion, Expansion

(D) Intake, Combustion, Expansion, Compression

67. The Brayton cycle consists of the following processes

(A) Two reversible isothermal and two reversible adiabatic

(B) Two reversible isobaric and two reversible adiabatic

(C) Two reversible isothermal and two reversible isochoric

(D) Two reversible isobaric and two reversible isothermal

68. If Q_1 is heat transferred to the working fluid and Q_2 is heat rejected from the working fluid, then the efficiency of the vapour power cycle is

(A) $\eta_{cycle} = 1 - \frac{Q_1}{Q_2}$

(B) $\eta_{cycle} = 1 + \frac{Q_1}{Q_2}$

(C) $\eta_{cycle} = 1 - \frac{Q_2}{Q_1}$

(D) $\eta_{cycle} = 1 + \frac{Q_2}{Q_1}$

69. If 'm' is mass of fluid and 'V' is velocity of the fluid, then the macroscopic kinetic energy 'E_k' of the fluid element by virtue of its motion is

(A) $E_k = \frac{m^2\bar{V}}{2}$

(B) $E_k = \frac{m\bar{V}}{2}$

(C) $E_k = \frac{m^2\bar{V}^2}{2}$

(D) $E_k = \frac{m\bar{V}^2}{2}$

70. The maximum amount of work that can be extracted from a system at a given state, till the system reaches at thermal equilibrium with the surrounding is known as

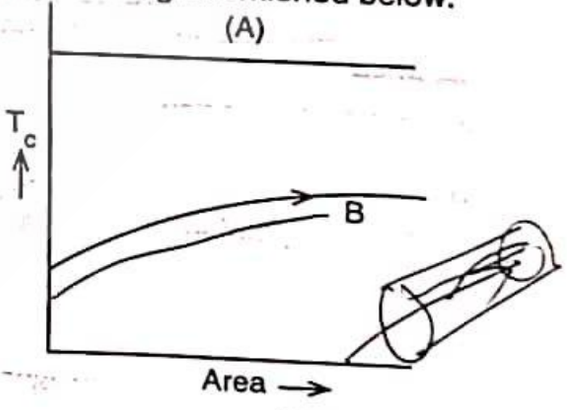
(A) Entropy

(B) Enthalpy

(C) Exergy

(D) Thermal power

71. In the case of cross flow heat exchanger, refer the fig. mentioned below.



The curve 'B' represents the temperature of fluid w.r.t. area at

(A) Inlet of heat exchanger

(B) Outlet of heat exchanger

(C) Cannot predicted

(D) None of the above

72. The unit with Stefan-Boltzman constant is
(A) W/m^2
(B) W/m^2k
(C) W/m^2k^4
(D) W/mk

73. It is advisable to put on white cloth in summer, the reason is for white cloth
(A) $\alpha = 0, \tau = 0$ and $\rho = 1$
(B) α = constant
(C) $\rho = 0, \tau = 0$ and $\alpha = 1$
(D) None of the above

74. Emissivity is the property of a surface and independent of
(A) Temperature
(B) Wavelength
(C) Source of radiation
(D) Heat

75. The concept of log-mean temperature difference is devised to study the heat transfer rate in heat exchangers, because
(A) Rate of heat flow varies along the path of heat exchanger
(B) Temperatures of fluids vary from point to point in heat exchanger
(C) Both (A) and (B)
(D) None of the above

76. In the computer aided design aspect ratio of an image is
(A) Ratio of vertical to horizontal pixel
(B) Ratio of vertical to diagonal pixel
(C) Ratio of horizontal to vertical pixel
(D) Ratio of horizontal to diagonal pixel

77. For increasing the productivity, CNC system can be interface with
(A) CAD/CAM
(B) DNC
(C) FMS
(D) All of the above

78. Consider the following statements regarding laws of robotics :
1. A robot may not injure a human being or through inaction, allow a human to be harmed.
2. A robot must obey orders given by humans except when that conflicts with first law.
3. A robot must protect its own existence.
Which of the following statements are correct ?
(A) 1 and 2 only
(B) 2 and 3 only
(C) 1, 2 and 3
(D) 1 and 3 only

79. Reach and stroke are specification of a robotic manipulator, which of the following relation is true between them ?
(A) Stroke = Reach
(B) Stroke ≤ Reach
(C) Stroke > Reach
(D) Stroke ≥ Reach

80. Which system is also known as 'sort wised' system ?
(A) Numerical Control (NC)
(B) Conventional Machine Tool
(C) Computer Numerical Control (CNC)
(D) None of the above

81. On a ladder resting on a smooth ground and leaning against rough vertical wall, the force of friction acts

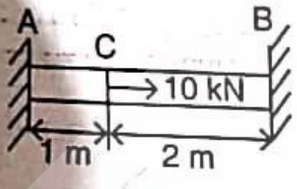
(A) Upwards at its upper end

(B) Toward the wall at the upper end

(C) Toward the wall at the lower end

(D) Downwards at its upper end

82. A prismatic bar is supported between two rigid supports as shown in figure. The support reaction will be



(A) $R_A = \frac{10}{3}$ kN, $R_B = \frac{20}{3}$ kN

(B) $R_A = \frac{20}{3}$ kN, $R_B = \frac{10}{3}$ kN

(C) $R_A = 10$ kN, $R_B = 10$ kN

(D) $R_A = 5$ kN, $R_B = 5$ kN

83. The radius of the Mohr's circle represents

(A) Minimum shear stress

(B) Minimum normal stress

(C) Maximum shear stress

(D) Maximum normal stress

84. The relationship between load intensity (W), shear force (S) and bending moment (M) is given by

(A) $W = \frac{dS}{dx}$ and $S = \frac{dM}{dx}$

(B) $W = \frac{dM}{dx}$ and $S = \frac{dW}{dx}$

(C) $S = \frac{dW}{dx}$ and $M = \frac{dS}{dx}$

(D) None of these

85. A cantilever is subjected to a uniformly distributed load over its entire length. The variation of bending stress along the length of the cantilever is

(A) Constant

(B) Linear

(C) Parabolic

(D) Not defined

86. The theoretical velocity of jet for an effective head (H) on the turbine is given by

(A) $2\sqrt{gH}$

(B) $\sqrt{2gH}$

(C) $2g\sqrt{H}$

(D) $g\sqrt{H}/2$

87. The place where cavitation is most likely to occur in hydraulic turbine is

(A) Inlet of turbine casing

(B) Inlet of guide vane

(C) Inlet of turbine runner

(D) Inlet of draft tube

88. Which is the wrong statement about hydraulic turbine ?
(A) The relative velocity over the moving blades increases in impulse turbines
(B) A pelton wheel is a tangential flow impulse turbine
(C) A francis turbine is a mix of radial and axial flow reaction turbine
(D) A kaplan turbine is a axial flow reaction turbine

89. The correct formula of specific speed of a hydraulic turbine under a head H rotating with speed N and giving power output as P is
(A) $\frac{P\sqrt{N}}{H^{3/4}}$
(B) $\frac{\sqrt{NP}}{H^{5/4}}$
(C) $\frac{N\sqrt{P}}{H^{5/4}}$
(D) $\frac{NP}{H^{3/4}}$

90. Velocity diagrams of hydraulic turbine can be used in calculation of
(A) Pressure in turbines
(B) Power generated by turbines
(C) Temperature variations in turbine
(D) Acceleration of turbine blades

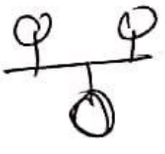
91. Whiteworth Quick return mechanism is an inversion of following basic mechanism
(A) Four bar chain mechanism
(B) Double slider crank chain mechanism
(C) Slider crank chain mechanism
(D) All of the above

92. Component of acceleration parallel to that link is called as
(A) Radial component
(B) Coriolis' component
(C) Final component
(D) Tangential component

93. A belt of rectangular cross section is known as
(A) Leather Belt
(B) V-Belt
(C) Crossed Belt
(D) Flat Belt

94. When gear has straight teeth parallel to the axes and are not subjected to axial thrust due to tooth load is called as
(A) Herringbone gear
(B) Spur gear
(C) Helical gear
(D) Bevel gear

95. In a mass balancing system, when several masses rotate in a different planes and when there does not exist any resultant centrifugal force or couple is called as
(A) Partial balancing
(B) Static balancing
(C) Dynamic balancing
(D) None of these



96. Heat transfer is that science which predicts the
(A) Rate of mass transfer
(B) Rate of energy transfer
(C) Rate of momentum transfer
(D) None of the above

97. The 'Thermal Transmittance' is also known as
(A) Energy
(B) Mass transfer
(C) Radiation
(D) Overall heat transfer coefficient

98. There exists a "critical thickness" beyond which the heat transfer rate
(A) Decreases
(B) Increases
(C) No effect on heat transfer
(D) None of the above

99. Which dimensionless number indicates the relative strength of buoyant to viscous force ?
(A) Stanton Number
(B) Nusselt Number
(C) Grashoff Number
(D) None of the above

100. The fluid motion in free convection is due to difference in density between various fluid layers caused by
(A) Atmospheric pressure
(B) Wind velocity
(C) Mass
(D) Temperature gradient

101. Consider two flat plates connected together by means of single riveted lap joint and subjected to a tensile force. The tensile resistance of unriveted solid plate is 35 kN. If the shear resistance of the rivet, tensile resistance of the riveted plate and crushing resistance of the plate per pitch length are given as 24.5 kN, 28 kN and 31.5 kN respectively. The efficiency of this joint will be
(A) 70%
(B) 75%
(C) 80%
(D) 90%

102. Hand peening is a method in which weld zone is hammered along the length with the peen of a hammer, while the joint is hot. Which of the following statements correctly specify the reasons for hand peening ?
I. It induces tensile residual stresses.
II. It induces compressive residual stresses.
III. It improves the fatigue life of the joint.
IV. It makes the joint leak proof.
Choose the best option from below :
(A) Statements I and II are correct but III and IV are incorrect
(B) Statements II and III are correct but I and IV are incorrect
(C) Statements I, II and III are correct but IV is incorrect
(D) Statements I, II, III and IV are correct

103. Which of the following statements are correct while designing a component for fatigue ?
I. Stress life method is used for designing for low cycle and high cycle fatigue.
II. Strain life method involves analysis of plastic deformation at a localised region.
III. Linear-elastic fracture mechanics uses fracture toughness of the material.
IV. Paris equation is used to determine the rate of crack growth.
Choose the best option from below :
(A) I and II are correct but III and IV are incorrect
(B) II and III are correct but I and IV are incorrect
(C) I, II and III are correct but IV is incorrect
(D) I, II, III and IV are correct

104. If the value of theoretical stress concentration factor is 1.0, then the value of fatigue stress concentration factor is equal to

(A) 0

(B) ∞ (infinite)

(C) 1

(D) 0.5

105. Consider a single V-groove butt welded joint between two plates of same thickness equal to 6 mm and same width of 60 mm is subjected to a tensile force of 36 kN. Assuming that the weld throat dimension is same as the thickness of the plate, then the average normal stress induced in the joint is equal to

(A) 50 MPa

(B) 100 MPa

(C) 150 MPa

(D) 200 MPa

106. Maximum shear stress in a hollow shaft subjected to a torsional moment is at the

(A) Inner surface of the shaft

(B) Outer surface of the shaft

(C) Middle of the thickness

(D) None of the above

107. A simply supported beam of span 'L' carrying a point load 'W' at mid span. The deflection at the centre of the beam is equal to

(A) $WL^2/48\ EI$

(B) $WL^3/48\ EI$

(C) $5WL^3/348\ EI$

(D) $WL^2/348\ EI$

108. The equivalent length of a column as per Euler's theory whose one end is fixed and the other end is hinged is given by

(A) $2l$

(B) l

(C) $l/2$

(D) $l/\sqrt{2}$

109. The maximum shear stress theory states that yielding of the material begins under the following relationship between maximum shear stress (τ_{max}) and yield stress (σ_y)

(A) $\tau_{max} = \sigma_y$

(B) $\tau_{max} = 2\sigma_y$

(C) $\tau_{max} = \sqrt{2}\,\sigma_y$

(D) $\tau_{max} = \frac{\sigma_y}{2}$

110. A thin seamless pipe of diameter 'd' m is carrying fluid under a pressure of 'p' kN/cm^2. If the maximum stress is not exceed 'σ' kN/cm^2, the necessary thickness 't' of metal in cm will be given as

(A) $t \geq \frac{pd}{2\sigma}$ cm

(B) $t \geq \frac{100pd}{2\sigma}$ cm

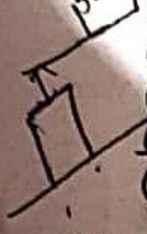
(C) $t \leq \frac{pd}{2\sigma}$ cm

(D) None of the above

111. For a cutting tool, the Taylor's equation is given as $V\sqrt{T} = 300$, where 'V' is the cutting speed in m/min and tool life 'T' is in minutes. If the cutting speed is reduced by 50%, then the tool life will be enhanced by

(A) 300%
(B) 200%
(C) 100%
(D) 400%

112. The type of fit of an assembly is designated as 50 H7s6. Using hole basis system, the type of fit is given by



(A) Clearance fit
(B) Transition fit
(C) Interference fit
(D) Loose running fit

113. Which of the following statements are correct for a component assembly with poor surface finish ?

I. Friction and wear increases.
II. Reduction in holding capacity of joints.
III. Fatigue limit is reduced.
IV. Improved corrosion resistance.

(A) I and II are correct
(B) I, II and III are correct
(C) I, II, III and IV are correct
(D) I, II and IV are correct

114. In abrasive jet machining, if the mixing ratio is constant, the MRR is

(A) Directly proportional to mass flow rate of gas
(B) Indirectly proportional to mass of abrasive
(C) Indirectly proportional to mass of gas
(D) Directly proportional to mass flow rate of abrasive

115. The angle between face of the tool and a line parallel with the base of the tool, measured in a perpendicular plane through the side cutting edge is

(A) Side relief angle
(B) Back rake angle
(C) Side rake angle
(D) End relief angle

116. Which of the following statement/ statements is/are correct ?

(A) PERT considers activity time as a random variable
(B) CPM considers a single deterministic time value for the activities
(C) CPM considers trade-off between time and cost
(D) All of the above

117. The "Information transmission device" used for system of inventory and production control is known as

(A) Poka-yoke
(B) Benchmarking
(C) Kanban
(D) Kaizen

118. Customers arrive at one person barber shop according to a Poisson process with a mean inter-arrival time of 20 minutes. Customers spend on an average of 15 minutes in the barber's chair. Determine how much time can a customer expect to wait for his turn ?

(A) 30 minutes
(B) 15 minutes
(C) 45 minutes
(D) 20 minutes

119. Determine initial basic feasible solution using VOGEL's approximation method to minimize total transportation cost.

Plant \ Warehouse	P	Q	R	Capacity
A	35	25	15	875
B	10	20	30	575
Demand	350	350	450	

(A) Rs. 15,750
(B) Rs. 18,300
(C) Rs. 17,375
(D) Rs. 20,275

120. A company requires 16,000 units of raw material costing Rs. 2 per unit. The cost of placing an order is Rs. 45 and the carrying costs are 10% per year per unit of the average inventory. Determine the economic order quantity.

(A) 2684 Units
(B) 2434 Units
(C) 2520 Units
(D) 2052 Units

121. The running cost of the CI engine compare to the SI engine is

(A) Less
(B) High
(C) Equal
(D) None of the above

122. In the following statement/statements which is/are correct ?

i. The cetane number characterises the ability of the fuel to auto ignite.
ii. The cetane number (CN) may be calculated by
CN = % hexadecane + 0.15 × (% heptamethylnonane).
iii. Diesel fuels are compared using an ignition delay metric.

(A) i only
(B) i and ii only
(C) i and iii only
(D) i, ii and iii

123. The solar radiation reaches on the Earth's surface. It's maximum flux density is

(A) 1.0 KW/m^2
(B) 0.5 KW/m^2
(C) 1.5 KW/m^2
(D) 2.0 KW/m^2

124. Which of the following statement/ statements is/are correct ?
Gas turbines may be classified on the basis of

i. Continuous combustion or constant pressure type.
ii. On the basis of the action of expanding gases.
iii. On the basis of direction of flow.

(A) i only
(B) i and ii only
(C) i and iii only
(D) i, ii and iii

125. In the following which statements are correct in SI engine, fuels to avoid detonation following are required ?

i. High auto ignition temperature.

ii. A long ignition lag.

iii. Short ignition lag.

(A) i and iii

(B) i and ii

(C) ii and iii

(D) i, ii and iii

126. Spinning body, which is free to move in other directions under the action of external forces, is called as

(A) Elliptical train

(B) Oscilloscope

(C) Gyroscope

(D) Blower

127. In a slider crank mechanism, radius of crank is 480 mm, it's angular velocity is 20 rad/s. Velocity of crank will be equal to

(A) 9.6 m/s

(B) 11.34 m/s

(C) 12.24 m/s

(D) 17.58 m/s

128. In a simple band brake, tension on tight side is 336 N; tension on slack side is 125.8 N; if radius of brake drum is 100 mm; then braking torque value will be

(A) 33 N.m

(B) 27 N.m

(C) 35 N.m

(D) 21 N.m

129. A belt runs over a pulley. The angle of lap is 165°. If coefficient of friction is 0.3, then ratio of tension (T_1/T_2) is

(A) 10.14

(B) 2.37

(C) 9.46

(D) 5.49

130. If a vibrating system consists of a mass of 50 kg; a spring with stiffness of 30 kN/m; then the value of critical damping coefficient will be

(A) 3295 N/m/s

(B) 2750 N/m/s

(C) 2450 N/m/s

(D) 3735 N/m/s

131. Which is not the characteristics of ideal fluid ?

(A) Incompressible

(B) No surface tension

(C) Follows Newton law of viscosity

(D) Inviscid

132. Which of the velocity fields will lead to steady three dimensional flow of an incompressible fluid ?

(A) $u = 7 + 3x^2y - 4xy^2; v = 1 + 8yz^2 - 4y^2z;$
$w = 6 + 7xz^3 - 5x^2z$

(B) $u = 3 - 2y^2z + 4yz^2; v = 2 + 6x^3z^2 - 7x^2z;$
$w = 5 - 8x^2y^3 + 9xy$

(C) $u = 4 - 5xy^2 + 7x^3y; v = 5 + 6y^2z - 7yz^3;$
$w = 2 - 3x^2z + 6xz^3$

(D) $u = 9 + 3x^3y - 5x^2y^3; v = 10 - 4y^2z + 7y^3z^2;$
$w = 7 + 5x^2z^3 - 2xz^2$

Bernoulli's theorem can be obtained from Euler's equation by assuming the following characteristics as constant

(A) Velocity

(B) Pressure

(C) Elevation

(D) Density

131. Which of the following parameter of fluid flow does not effect its Reynold's Number ?

(A) Density of fluid

(B) Mean fluid velocity

(C) Temperature of fluid

(D) Characteristics dimension of fluid flow cross-section

132. In which of the following numbers gravitational force is the most significant ?

(A) Froude Number

(B) Mach Number

(C) Weber Number

(D) Euler Number

133. In ultrasonic machining, abrasive particles motion is _____ to the workpiece.

(A) Tangential

(B) Oscillatory

(C) Circular

(D) Normal

134. The energy transferred to the work material in EBW is

(A) Kinetic

(B) Thermal

(C) Atomic

(D) Electrical

135. Coordinate measuring machine is a _____ instrument.

(A) Electrical

(B) Mechanical

(C) Metrological

(D) Aesthetic

139. Continuous chips can be produced during machining of

(A) Brass

(B) Bronze

(C) Cast iron

(D) Copper

140. Accelerating wear rate is found in

(A) Steady-state wear region

(B) Break-in period

(C) Failure region

(D) Accelerating period

141. A stationary mass of gas is compressed without friction from an initial state of 0.2 m^3 and 0.1 MPa to a final state of 0.1 m^3 and 0.1 MPa, the pressure remaining constant during the process. There is a transfer of 35 kJ of heat from the gas during the process. The internal energy of the gas change will be

(A) – 15 kJ
(B) + 15 kJ
(C) – 25 kJ
(D) + 25 kJ

142. The state of thermodynamic system where the value of the property is same at all the points is known as

(A) Mechanical equilibrium
(B) Thermal equilibrium
(C) Chemical equilibrium
(D) Thermodynamic equilibrium

143. A cyclic heat engine operates between a source temperature of 500°C and a sink temperature of 50°C. The least rate of heat rejection per kW net output of the engine will be

(A) 0.10 kW
(B) 0.41 kW
(C) 0.60 kW
(D) 0.71 kW

144. Availability function for a closed system is

(A) U + PV – TS
(B) U – PV + TS
(C) U + PV + TS
(D) U – PV – TS

145. Which of the following is an intensive property ?

(A) Entropy
(B) Volume
(C) Pressure
(D) All of the above

146. List – I specifies the type of ends of helical compression spring and List – II consists of the formulas for calculating the pitch of the spring.

Match List – I and List – II and select the correct answer using the codes given below the lists.

List – I	List – II
J. Plain ends	1. $(L_0 - 2d)/Na$
K. Plain and ground ends	2. $(L_0 - 3d)/Na$
L. Squared ends	3. $L_0/(Na + 1)$
M. Squared and ground ends	4. $(L_0 - d)/Na$

(Where, Na = Number of active coils, L_0 = free length of the spring and d = diameter of spring wire)

Codes :

	J	K	L	M
(A)	1	2	3	4
(B)	2	1	4	3
(C)	4	3	2	1
(D)	3	1	4	2

147. The proof load is defined as the maximum load that a bolt can with stand without acquiring a permanent set. Which of the following strengths defines the proof strength ?

(A) Fatigue strength of the bolt
(B) Shear strength of the bolt
(C) Tensile strength of the bolt
(D) All of the above

148. Which of the following statements are correct in the case of torque transmission through a cone clutch ?

I. Torque capacity is directly proportional to sin α, where α is half cone angle.
II. If half cone angle (α) is less than the angle of static friction, then cone clutch has tendency to self engage.
III. For the given dimensions, torque capacity of cone clutch is higher than that of single plate clutch.
IV. Width of friction lining does not affect the torque capacity.

Choose the best answer from below :

(A) I and II are correct but III and IV are incorrect
(B) II and III are correct but I and IV are incorrect
(C) I, II and III are correct but IV is incorrect
(D) I, II, III and IV are correct

149. A machine component is subjected to fluctuating stress that varies from 40 to 100 MPa. If corrected endurance limit of the component is 300 MPa and ultimate tensile strength of the material is 700 MPa, then the factor of safety of the designed component according to Goodman equation is given by

(A) 1
(B) 2
(C) 4
(D) 5

150. Based on the comparison of a hollow shaft with a solid shaft for the same weight, following statements are made

I. Natural frequency of hollow shaft is higher than that of the solid shaft.
II. Stiffness of a hollow shaft is more than that of a solid shaft.
III. The diameter of a hollow shaft is greater than that of a solid shaft for same torque transmission.
IV. Hollow shaft is manufactured by extrusion process.

Choose the best statements from above which signify the advantages of hollow shaft over a solid shaft and answer below :

(A) Statements I and II only
(B) Statements II and III only
(C) Statements III and IV only
(D) Statements I and IV only

[P.T.O.