

Sl. No.:

Register
Number

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2018

**MECHANICAL/PRODUCTION/MANUFACTURING
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. The applicant will be supplied with Question Booklet 15 minutes before commencement of the examination.
2. This Question Booklet contains **200** questions. Prior to attempting to answer the candidates are requested to check whether all the questions are there in series and ensure there are no blank pages in the question booklet. **In case any defect in the Question Paper is noticed it shall be reported to the Invigilator within first 10 minutes and get it replaced with a complete Question Booklet. If any defect is noticed in the Question Booklet after the commencement of examination it will not be replaced.**
3. Answer **all** questions. All questions carry equal marks.
4. 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.
5. An answer sheet will be supplied to you, separately by the Room Invigilator to mark the answers.
6. You will also encode your Question Booklet Number 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, action will be taken as per commission's notification.
7. 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.
8. In the Answer Sheet there are **four** circles (A), (B), (C) and (D) against each question. To answer the questions you are to mark with Blue or Black ink Ball point pen **ONLY ONE** circle 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)
9. 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 time of 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.
10. The sheet before the last page of the Question Booklet can be used for Rough Work.
11. Do not tick-mark or mark the answers in the Question Booklet.
12. Applicants have to write and shade the total number of answer fields left blank on the boxes provided at side 2 of OMR Answer Sheet. An extra time of 5 minutes will be given to specify the number of answer fields left blank.
13. 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.

SEAL

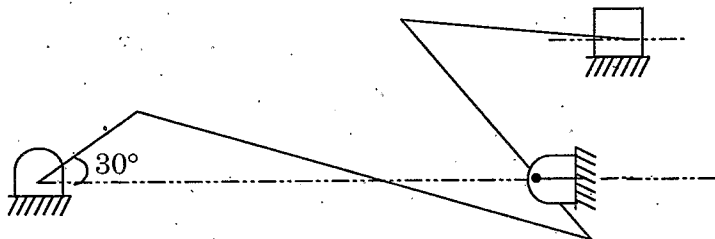
SPACE FOR ROUGH WORK

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PA 201001



- The energy possessed by a body, for doing work by virtue of its position, is called
 - (A) potential energy
 - (B) kinetic energy
 - (C) electrical energy
 - (D) chemical energy
- 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
- 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
- When a body of moment of inertia (I) is rotated about that axis with an angular velocity, then the K.E of rotation is
 - (A) $0.5 I\omega$
 - (B) $I\omega$
 - (C) $0.5 I\omega^2$
 - (D) $I\omega^2$
- Number of instantaneous centre for the mechanism will be



- (A) 6
 - (B) 12
 - (C) 14
 - (D) 15
- Which of the following mechanism is made up of turning pairs?
 - (A) Scott-Russel mechanism
 - (B) Peaucellier mechanism
 - (C) Watt mechanism
 - (D) Pantograph

7. Three rotors connected by shaft, when subjected to torsional vibration will have
- (A) no node (B) one node
 (C) two nodes (D) three nodes
8. A shaft of length 0.75 m, supported freely at its ends, is carrying a mass 90 kg at 0.25 m from one end. Find the fundamental frequency of transverse vibration. Take $E = 200$ Gpa shaft dia 0.05 m
- (A) 84.95 Hz (B) 84.85 Hz
 (C) 48.95 Hz (D) 49.85 Hz
9. Lateral strain (ϵ') can be expressed as
- (A) $\frac{\delta l}{l}$ (B) $\frac{l}{\delta l}$
 (C) $\gamma \epsilon$ (D) $-\gamma \epsilon$
10. The reaction at the support of a beam with fixed end is referred as
- (A) fixed end moment (B) fixed end couple
 (C) floating end moment (D) floating end couple
11. Which of the following is the condition for detached flow?
- (A) $\left(\frac{\partial u}{\partial y}\right)_{y=0} = 0$ (B) $\left(\frac{\partial u}{\partial y}\right)_{y=0} > 0$
 (C) $\left(\frac{\partial u}{\partial y}\right)_{y=0} < 0$ (D) $\left(\frac{\partial u}{\partial y}\right)_{y=0} = \infty$
12. $\sigma \propto \epsilon$. This rule is known as
- (A) Castinglo's theorem (B) Hook's law
 (C) Young's theorem (D) Reynold law

13. The equivalent length of a column supported firmly at both end is
- (A) $2l$ (B) $0.7l$
 (C) l (D) $0.5l$
14. The value of J in equation $\frac{T}{J} = \frac{S_s}{y} = \frac{G\theta}{l}$ for a circular shaft of diameter d is
- (A) $\frac{\pi d^4}{32}$ (B) $\frac{\pi d^4}{64}$
 (C) $\frac{\pi d^4}{16}$ (D) $\frac{\pi d^3}{32}$
15. For applications involving high stresses in one direction only the following type of thread will be best suited
- (A) ISO metric thread (B) acme thread
 (C) square thread (D) buttren thread
16. The rated life of a bearing varies
- (A) directly as load (B) inversely as square of load
 (C) inversely as cube of load (D) inversely as fourth power of load
17. The holes in the flange coupling for coupling the two flanges together by bolts are reamed because it permits
- (A) equal sharing of load by bolts
 (B) avoidance of stress concentration
 (C) avoidance of any injury during dismantling
 (D) less mere, tear and vibration
18. It is usually preferable in chain drive to use
- (A) even number of teeth on sprocket
 (B) odd number of teeth on sprocket
 (C) either even or odd, but certain minimum number
 (D) maximum number of teeth permissible on sprocket

19. An oil of specific gravity 0.9 is contained in a vessel. At a point the height of oil is 40 m. Find the corresponding height of water at the point
- (A) 900 m (B) 36 m
(C) 10.33 m (D) 18 m
20. A stone weighs 392.4 N in air and 196.2 N in water. Find the weight of water displaced.
- (A) 392.4 N (B) 196.2 N
(C) 3.924 N (D) 1.962 N
21. Newton's law of viscosity is given by the relation
- (A) $\tau = \mu^2 \frac{du}{dy}$ (B) $\tau = \mu \frac{du}{dy}$
(C) $\tau = \mu \frac{dy}{du}$ (D) $\tau = \mu^2 \frac{dy}{du}$
22. If a pipe contains an oil of sp.gr 0.9 and a differential manometer connected at the two points A and B shows a difference in mercury level as 15 cm, the difference of pressure at the two points will be
- (A) 1.32435 N/m² (B) 1905 N/m²
(C) 18688 N/m² (D) 124587 N/m²
23. The velocity component in x and y directions in terms of stream function (ψ) are
- (A) $u = \frac{\partial \psi}{\partial x}, v = \frac{\partial \psi}{\partial y}$ (B) $u = -\frac{\partial \psi}{\partial x}, v = \frac{\partial \psi}{\partial y}$
(C) $u = \frac{\partial \psi}{\partial y}, v = \frac{\partial \psi}{\partial x}$ (D) $u = -\frac{\partial \psi}{\partial y}, v = \frac{\partial \psi}{\partial x}$
24. In pipe flow, loss of head due to sudden contraction is given as
- (A) $\frac{V_2}{g} \left(\frac{1}{c_c} - 1 \right)^2$ (B) $\frac{V_2^2}{2g} \left(\frac{1}{c_c} - 1 \right)^2$
(C) $\frac{V_2}{g^2} \left(\frac{1}{c_c} - 1 \right)^2$ (D) $\frac{V_2^2}{2g} \left(\frac{1}{c_c} - 1 \right)$

25. The velocity distribution across a section of a circular pipe having viscous flow is given by

(A) $u = U_{\max} \left[1 - \left(\frac{r}{R} \right)^2 \right]$

(B) $u = U_{\max} [R^2 - r^2]$

(C) $u = U_{\max} \left[1 - \frac{r}{R} \right]^2$

(D) $u = U_{\max} \left[1 + \frac{r}{R} \right]^2$

26. The specific speed of a turbine is expressed as

(A) $\frac{N\sqrt{P}}{H}$

(B) $\frac{N\sqrt{P}}{H^2}$

(C) $\frac{N\sqrt{P}}{H^{3/4}}$

(D) $\frac{N\sqrt{P}}{H^{5/4}}$

27. The discharge through Kaplan turbine is given by

(A) $Q = \pi DBV_f$

(B) $Q = \frac{\pi}{4} d^2 \times \sqrt{2gH}$

(C) $Q = \frac{\pi}{4} [D_0^2 - D_b^2] \times V_f$

(D) $Q = 0.9\pi DBV_f$

28. If the head on the turbine is more than 300 m, the type of turbine used should be

(A) Kaplan

(B) Francis

(C) Pelton wheel

(D) Propeller

29. Hydraulic efficiency of a turbine is

(A) power available at the inlet of turbine to power given by water to the turbine

(B) power of the shaft of the turbine to power given by water to the turbine

(C) power at the shaft of the turbine to the power of inlet of the turbine

(D) power at the shaft of the turbine to power delivered by water

30. The temperature at which the volume of gas becomes zero is called

(A) absolute scale of temperature

(B) absolute zero temperature

(C) absolute temperature

(D) dew point temperature

31. The value of 'n' index for constant volume process is equal to
- (A) $n=0$ (B) $n=1$
(C) $n=\gamma$ (D) $n=\infty$
32. What are the properties of a thermodynamic system whose value for the entire system is equal to the sum of their values for individual parts of the system?
- (A) Thermodynamic properties (B) Extensive properties
(C) Intensive properties (D) Specific properties
33. In a free expansion of a gas between two equilibrium states, work transfer involved
- (A) can be calculated by joining the two states on p-v coordinates by any path and estimating area below
(B) can be calculated by joining two states by a quasi static path and then finding the area below
(C) is zero
(D) is equal to heat generated by friction during expansion
34. Carnot cycle efficiency is maximum when
- (A) initial temperature is 0°K
(B) final temperature is 0°K
(C) difference between initial and final temperature is 0°K
(D) final temperature is 0°C
35. The internal energy of a substance depends on
- (A) temperature (B) pressure
(C) entropy (D) enthalpy
36. Unavailable energy is the portion of energy that
- (A) cannot be converted into work by a turbine
(B) cannot be converted into work even by a reversible heat engine
(C) cannot be converted into work by Rankine engine
(D) cannot be converted into work by a pump

37. For a given heat flow and for the same thickness, the temperature drop across the material will be maximum for
- (A) copper (B) steel
 (C) glass-wool (D) refractory brick
38. Work done in a free expansion process is
- (A) positive (B) negative
 (C) zero (D) maximum or minimum
39. For non-circular ducts, the hydraulic diameter is defined as
 (A – sectional area of the duct; P – Wetted perimeter of the duct)
- (A) $D_h = \frac{4A}{P}$ (B) $D_h = \frac{2A}{P}$
 (C) $D_h = \frac{3A}{2P}$ (D) $D_h = \frac{A}{4P}$
40. The critical radius of insulation for a spherical shell is
- (A) $r_c, \text{ sphere} = \frac{k}{h}$ (B) $r_c, \text{ sphere} = \frac{k}{2h}$
 (C) $r_c, \text{ sphere} = \frac{2k}{h}$ (D) $r_c, \text{ sphere} = \frac{2k}{3h}$
41. The velocity and thermal boundary layers coincide, and the non dimensional velocity and temperature profiles are identical for steady, incompressible, laminar flow over a flat plate when
- (A) $P_r = 1$ (B) $P_r < 1$
 (C) $P_r > 2$ (D) $P_r \geq 2.5$
42. For simple shapes such as plates, cylinders, sphere and cubes, the lumped heat capacity approach can be used if
- (A) $B_i < 0.1$ (B) $B_i = 1.0$
 (C) $B_i > 1.0$ (D) $B_i > 0.1$

43. The diffusion coefficient of carbon through iron during a hardening process
- (A) decreases with temperature
 - (B) remains constant as temperature increases
 - (C) remains constant as pressure increases
 - (D) increases with temperature
44. The driving potential in mass transfer process is
- (A) concentration gradient
 - (B) temperature gradient
 - (C) pressure gradient
 - (D) velocity gradient
45. Air refrigeration cycle is used in
- (A) commercial refrigerator
 - (B) domestic refrigerator
 - (C) gas liquefaction
 - (D) air-conditioning
46. In milk chilling plants, the secondary refrigerant used usually is
- (A) ammonia solution
 - (B) sodium silicate
 - (C) glycol
 - (D) brine
47. Work ratio is the ratio of
- (A) network / turbine work
 - (B) turbine work / compressor work
 - (C) network / compressor work
 - (D) compressor work / network
48. Reverse of electroplating process is
- (A) Electro Discharge Machining (EDM)
 - (B) Electro Chemical Machining (ECM)
 - (C) Laser Beam Machining (LBM)
 - (D) Abrasive Jet Machining (AJM)
49. The elastic stress-strain behaviour of rubber is
- (A) linear
 - (B) non-linear
 - (C) plastic
 - (D) normal curve

50. Allotropic metal,
 (A) exists in more than one type of lattice structure depending upon temperature
(B) has equal stresses in all directions
(C) has only one lattice structure of all temperatures
(D) gives equal strain in all directions
51. The process used for relieving internal stress which is previously set up in the metal work and for increasing the machinability of steel is
(A) normalising
(B) annealing
(C) cyaniding
 (D) spheroidising
52. Steel can be hardened quickly by the process of
(A) nitriding
(B) cyaniding
(C) carburising
 (D) induction hardening
53. Induction hardening is the process of
 (A) hardening surface of work piece to obtain hard and wear resistant surface
(B) heating and cooling rapidly
(C) increasing hardness throughout
(D) inducing hardness by continuous process
54. Gibb's phase rule is given by the expression F which is equal to,
(A) $C + P$
(B) $C - P - 2$
(C) $C + P - 2$
 (D) $C - P + 2$
where F = no. of degrees of freedom, C = no. of compounds and P = no. of phases
55. Beryllium is used chiefly as an alloy addition to copper for producing
(A) precipitation - hardenable alloy
(B) corrosion resistant alloy
(C) high - strength alloy
 (D) non-magnetic and non-sparking alloy

56. Which of the following metals can be easily drawn into wire?
(A) tin
(B) copper
(C) lead
(D) zinc
57. In case of ferromagnetic materials, the spin moments associated with two sets of atoms are aligned
(A) parallel to each other
(B) antiparallel to each other
(C) antiparallel but of unequal magnitude
(D) randomly
58. Core prints are used to
(A) support and locate the core in the mould
(B) fabricate core
(C) facilitate easy removal of the core
(D) give different shapes to the core
59. Surfaces to be left unfinished are to be painted
(A) red
(B) blue
(C) black
(D) yellow
60. A process employed to produce seamless tubing is known as
(A) hot spinning
(B) piercing
(C) extrusion
(D) rolling
61. Rotary swaging is the operation
(A) employed to expand a tubular or cylindrical
(B) part to reduce the cross-sectional area of rods and tubes
(C) in which the edges of sheet are turned over to provide stiffness and a smooth edge
(D) causes a steadily applied pressure on work piece instead of impact force

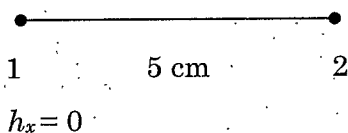
62. The Indian Standard Marking system for a grinding wheel is read as WA46K5V17. The alphabet 'K' denotes
- (A) bond type (B) grain size
(C) abrasive (D) grade
63. In NC part programming, F-code indicates
- (A) the type of motion or action is to be carried out
(B) the spindle speed at which the spindle rotates
(C) the type of tool
 (D) the rate at which the spindle moves along a programming axis
64. Ultrasonic Machining (USM) process mainly used for machining
- (A) plastic materials (B) ductile materials
 (C) hard and brittle materials (D) semi conductive materials
65. It is required to punch a hole of diameter 10 mm on a sheet of thickness 3. The shear strength of the work material is 420 Mpa. The required punch force is
- (A) 19.78 kN (B) 39.56 kN
(C) 98.9 kN (D) 359.6 kN
66. In a green sand molding process, uniform ramming leads to
- (A) less chance of porosity
(B) uniform flow of molten metal into mold cavity
 (C) greater dimensional stability of the casting
(D) less sand expansion type of casting defect
67. Which of the following welding process does not use consumable electrodes?
- (A) gas metal arc welding (B) gas tungsten arc welding
(C) submerged arc welding (D) flux coated arc welding

68. If "P" is the pitch of thread and " θ " is semi-angle of thread, then the best size wire for measuring the effective diameter of threads is of diameter,
- (A) $\frac{P}{2} \sec \theta$ (B) $\frac{P}{2} \cos \theta$
- (C) $\frac{P}{4} \sec \theta$ (D) $P \sec \theta$
69. If \bar{X} and R represent mean value and range respectively, then coefficient of variation in terms of standard deviation σ is defined as
- (A) $\sigma^2 \times 100$ (B) $\sqrt{\sigma} \times 100$
- (C) $\frac{\sigma}{\bar{X}} \times 100$ (D) $\frac{\sigma}{R} \times 100$
70. Which of the following errors are generally distributed in accordance with the Gaussian distribution?
- (A) controllable errors (B) calibration errors
- (C) avoidable errors (D) random errors
71. The type of gauge which has gauging sections combined on one end is
- (A) combination gauge (B) progressive gauge
- (C) limit gauge (D) fixed gauge
72. Which one of the following is the most accurate measuring device/instrument?
- (A) steel rule (B) digital micrometer
- (C) vernier caliper (D) laser micrometer
73. The value of a set of data at which the greatest number of cases is concentrated is called
- (A) mean (B) median
- (C) standard deviation (D) mode

74. Reference junction compensation in thermocouples can be accomplished through the use of
- (A) hardware only (B) software only
 (C) both hardware and software (D) vapour filled thermometer
75. Approximately what area is covered under the normal distribution curve between ± 3 standard deviation
- (A) 80% (B) 88.00%
 (C) 99.73% (D) 68.00%
76. Elements and sequence of Juran's Trilog with regard to quality are,
- (A) analyse, improve, control (B) plan, do, study, act
 (C) plan, control, improve (D) measure, analyse, improve, control
77. An example of an attribute gauge is a
- (A) plug gauge (B) micrometer
(C) slip gauge (D) an angle gauge
78. The mercin instrument assesses the surface irregularities through
- (A) fringe pattern (B) air leakage method
 (C) frictional properties (D) thermal properties
79. The general way of describing cylindricity of a component is by the
- (A) minimum - zone method (B) maximum - zone method
(C) limited zone method (D) cylinder zone method
80. The digitized frame of the image in a machine vision system is referred as
- (A) ADC (B) Frame buffer
(C) Vision buffer (D) DAC

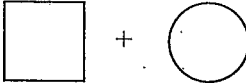
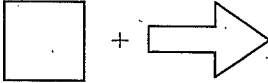


81. Which one of the following is not the division of Flexible Manufacturing System (FMS) Class?
- (A) Flexible Manufacturing Module (FMM)
 - (B) Flexible Fabrication – Machining – Assembly Sysetm (FFMAS)
 - (C) Flexible Manufacturing Group (FMG)
 - (D) Flexible Manufacturing Technology (FMT)
82. CAD/CAM technology was initiated in the
- (A) Die industry
 - (B) Nuclear industry
 - (C) Aerospace industry
 - (D) Medical industry
83. In cellular type layout,
- (A) families of batches and parts that utilize similar machines, labour skills or tooling are grouped together to form cells
 - (B) fixed site production is characterized by moving equipment, tools, material and personnel to the production site
 - (C) each set of machines is arranged so that only one product is manufactured on each line
 - (D) grouping of similar equipment by function to produce variety of products in small volume
84. Types of Kanban system are
- (A) process Kanban and ordering Kanban
 - (B) stock Kanban and sub assemblies Kanban
 - (C) production-ordering Kanban and the withdrawal Kanban
 - (D) product Kanban and machine Kanban
85. The APT (Automatically Programmed Tools) language is used in
- (A) Drafting systems
 - (B) NC machines
 - (C) Programmable controllers
 - (D) Large automation systems.

86. The translation distances dx, dy is called as
- (A) translation vector
 - (B) shift vector
 - (C) both (A) and (B)
 - (D) neither translation or shift but δ
87. MACRO subroutine is defined by the format
- (A) MACRO = Parameter
 - (B) Symbol = MACRO / Parameter
 - (C) MACRO / Parameter
 - (D) MACRO
88. Which Robot configuration represent a human arm?
- (A) Mechanical configuration
 - (B) Polar configuration
 - (C) Cylindrical configuration
 - (D) Jointed arm configuration
89. Standardisation of products is done to
- (A) eliminate unnecessary varieties in design
 - (B) simplify manufacturing process
 - (C) make interchangeable manufacturing
 - (D) reduce material cost
90. The shape function N_1 of linear bar element shown in figure at node 1



- (A) 1
- (B) 0
- (C) 0.5
- (D) 0.1

91. The process chart symbol used to indicate inspection-cum operation is

- (A) 
- (B) 
- (C) 
- (D) 

92. Which one of the following technique is used for determining allowances in Time study?

- (A) performance rating
- (B) work sampling
- (C) linear regression
- (D) acceptance sampling

93. In basic inventory model, the minimum total yearly inventory cost is calculated by

- (A) $T_{cm} = \sqrt{2DC_o \cdot C_h}$
- (B) $T_{cm} = \sqrt{2DC_o \cdot C_h(1 - d/p)}$
- (C) $T_{cm} = 2\sqrt{DC_o \cdot C_h}$
- (D) $T_{cm} = 2\sqrt{DC_o \cdot C_h(1 - d/p)}$

where T_{cm} = minimum total yearly inventory cost

D – Annual demand

C_o – Ordering cost

C_h – Inventory carrying cost

P – Production rate.

d – Demand rate

94. In the Halsey system of wage incentive plan, a worker is
- (A) paid as per efficiency
 - (B) ensured of minimum wages
 - (C) never a loser
 - (D) induced to do more work
95. In the Simplex method, the existence of more than one optimum solution is indicated, when
- (A) some of the values in the constant column (b_i) are zero
 - (B) all the replacement ratios, $\frac{b_i}{a_i}$ (a_i - key column coefficient are negative)
 - (C) values of the index row, $z_j - c_j$ or $c_j - z_j$ under one or more of the non-basic variables is/are zero
 - (D) artificial variables are present in the base
96. The string diagram is
- (A) a scale plan or model on which a thread is used to trace and measure the path of workers, material or equipment
 - (B) a tabular record for presenting quantitative data about the movement of workers, materials or equipments
 - (C) a chart in which the workers, materials or equipments are recorded on a common time scale to show their inter-relationship
 - (D) a technique for measuring time taken by workers
97. In the PERT network, an activity has an optimistic time of 3 days, pessimistic time of 15 days and the expected time is 7 days. The most likely time of the activity is
- (A) 6 days
 - (B) 7 days
 - (C) 5 days
 - (D) 9 days

98. If two equal forces of magnitude P act at an angle θ° , their resultant will be
- (A) $P/2 \cos \theta/2$ (B) $2P \sin \theta/2$
 (C) $2P \tan \theta/2$ (D) $2P \cos \theta/2$
99. On a ladder resting on smooth ground and leaning against vertical wall, the force of friction will be
- (A) towards the wall at its upper end (B) away from the wall at its upper end
 (C) upwards at its upper end (D) downwards at its upper end
100. A ship will sink if it does not displace water equal to its own
- (A) volume (B) density
 (C) surface area (D) weight
101. A particle moves along a straight line such that distance (x) traversal in t seconds is given by $x = t^2(t-4)$, the acceleration of the particle will be given by the equation
- (A) $3t^2 - 2t$ (B) $3t^2 + 2t$
 (C) $6t - 8$ (D) $6t - 4$
102. The radius of gyration of a disc type flywheel of diameter D is
- (A) D (B) $D/2$
 (C) $D/4$ (D) $\frac{3}{\sqrt{2}}D$
103. Partial balancing in locomotives results in
- (A) hammer blow, variation of tractive effort, swaying couple
 (B) least wear
 (C) most smooth operation
 (D) better performance of engine
104. Which of the following pairs is correctly matched?
- (A) Coulomb – Energy principle (B) Rayleigh – Dynamic equilibrium
 (C) D'Alembert – Damping force (D) Fourier – Frequency domain analysis

105. The mean dia of screw jack having pitch 10 mm is 50 mm. A load of 20 kN is lifted to a dist. of 170 mm. Find the work done in lifting the load when the load rotates with the screw. The external and internal dia. of the bearing surface of the loose head are 60 mm and 10 mm resp. Take $\mu = 0.08$.

- (A) 72.25 N-m
- (B) 31.85 N-m
- (C) 7718 N-m
- (D) 10025 N-m

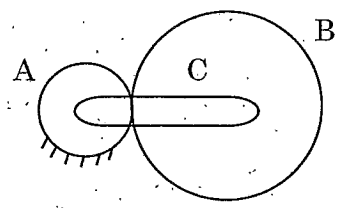
106. Law of gearing is satisfied, if

- (A) two surfaces slides correctly
- (B) common normal at the point of contact passes through the pitch point
- (C) common tangent at the point of contact passes through the pitch point
- (D) addendum > dedendum

107. The train value of a gear train is

- (A) equal to velocity ratio
- (B) reciprocal of velocity ratio
- (C) always greater than unity
- (D) always equal to unity

108. Ref. the fig. Gear B rotates at 150 rpm. about its own axis. The arm C will rotate by $T_A = 20$; $T_B = 40$



- (A) 150 rpm
- (B) 200 rpm
- (C) 100 rpm
- (D) 250 rpm

109. A mass M is attached to a spring whose upper end is fixed. The mass and stiffness of the spring are m and K resp. The natural frequency of the system would be

- (A) $\frac{1}{2\pi} \sqrt{\frac{K}{m+m}}$
- (B) $\frac{1}{2\pi} \sqrt{\frac{2K}{m+m}}$
- (C) $\frac{1}{2\pi} \sqrt{\frac{3K}{m+3m}}$
- (D) $\frac{1}{2\pi} \sqrt{\frac{2K}{m+2m}}$

117. Anti-friction bearings are
- (A) sleeve bearings
 - (B) gas lubricated bearings
 - (C) ball and roller bearings
 - (D) special bearings requiring no lubricant
118. Stretching in a belt can be controlled by
- (A) decreasing belt length
 - (B) increasing centre distance
 - (C) increasing pulley diameter
 - (D) reducing stress in the belt
119. Centrifugal tension in belts
- (A) reduces power transmission
 - (B) increases power transmission
 - (C) does not affect power transmission
 - (D) increase power transmission at high speed and decreases it at lower speed
120. Property of a fluid by which molecules of different kinds of fluids are attracted to each other is called
- (A) adhesion
 - (B) cohesion
 - (C) viscosity
 - (D) surface tension
121. The intensity of pressure at any point in a liquid at rest is same in all directions. The above statement is known as
- (A) Kirchoff's law
 - (B) Pascal's law
 - (C) Newton's law
 - (D) Darcy-Weisbach law
122. The viscosity of liquid _____ with increase in temperature.
- (A) decreases
 - (B) increases
 - (C) first increases and then decreases
 - (D) first decreases and then increases

123. The boundary layer separation occurs when

(A) $\frac{dp}{dx} < 0$

(B) $\left(\frac{\partial u}{\partial y}\right)_{y=0} = 0$

(C) $\left(\frac{\partial u}{\partial y}\right)_{y=0} > 0$

(D) $\frac{dp}{dx} > 0$

124. Compressibility is the reciprocal of

(A) bulk modulus of elasticity

(B) shear modulus of elasticity

(C) young's modulus of elasticity

(D) viscosity

125. The boundary layer is called turbulent boundary layer if

(A) Reynolds number is more than 2000

(B) Reynolds number is more than 4000

(C) Reynolds number is more than 5×10^5

(D) Reynolds number is more than 6×10^5

126. Euler's dimensionless number relates the following :

(A) Inertial force and gravity force

(B) pressure force and inertial force

(C) viscous force and gravity force

(D) pressure force and viscous force

127. A streamline body is defined as a body about which

(A) the drag is zero

(B) the flow is laminar

(C) the flow is along the streamlines

(D) the flow separation is suppressed

128. When the pipes are connected in series, the total rate of flow

(A) is equal to the sum of the rate of flow in each pipe

(B) is equal to the reciprocal of the sum of the rate of flow in each pipe

(C) is the same as flowing through each pipe

(D) is varied in each pipe

129. Which of the following is not a property of the system?

- (A) temperature (B) pressure
(C) specific volume (D) heat

130. For a compression or heating process what is the expression for effectiveness ϵ

(A) $\epsilon = \frac{\text{increase of availability of surroundings}}{\text{loss of availability of the system}}$

(B) $\epsilon = \frac{\text{increase of availability of the system}}{\text{loss of availability of the surroundings}}$

(C) $\epsilon = \frac{\text{loss of availability of the surroundings}}{\text{increase of availability of the system}}$

(D) $\epsilon = \frac{\text{loss of availability of the system}}{\text{increase of availability of the surroundings}}$

131. The equation of state $pv = RT \left(B_0 + \frac{B_1}{v} + \frac{B_2}{v^2} + \frac{B_3}{v^3} \right)$ is known as

- (A) Vander Waal's equation (B) Benedict-Webb-Rubin equation
(C) Gibbs equation (D) Virial equation

132. Joules law states that the specific internal energy of a gas depends only on

- (A) the pressure of the gas (B) the volume of the gas
(C) the temperature of the gas (D) pressure and volume of the gas

133. Irreversibility of the process is equal to

- (A) $W_{\max} - W$ (B) $W - W_{\max}$
(C) W_{\max} (D) W

134. 300 kJ/s of heat is supplied at a constant fixed temperature of 290°C to a heat engine. 150 kJ/s of heat are rejected at 8.5°C. Then the cycle is reported as

- (A) Reversible (B) Irreversible
(C) Impossible (D) Random

135. The two reference fuels used for cetane rating are
- (A) cetane and isocetane (B) cetane and tetraethyl lead
(C) cetane and n-heptane (D) cetane and alpha methyl naphthalene
136. Reheating of Rankine cycle will
- (A) not alter turbine efficiency
(B) improve the steam quality
(C) decrease the nozzle and blade efficiency
(D) decrease the turbine efficiency
137. Anything that generates entropy always
- (A) increases enthalpy (B) decreases pressure
(C) decreases energy (D) lowers chemical reaction
138. The processes of a Carnot cycle are
- (A) Two adiabatic and two constant volume
(B) Two adiabatic and two isothermal
(C) Two isentropic and two isothermal
(D) Two isothermals and two constant pressure
139. The value of characteristic constant of oxygen would be
- (A) 0.412 kJ/kg-K (B) 0.262 kJ/kg-K
(C) 1.004 kJ/kg-K (D) 0.624 kJ/kg-K
140. If the value of n is zero in the equation $pV^n = c$, then the process is called
- (A) constant volume process (B) constant pressure process
(C) adiabetic process (D) isothermal process
141. For any irreversible process net entropy change is
- (A) zero (B) positive
(C) negative (D) infinite

142. For a specified NTU and capacity ratio 'c', the effectiveness will be the highest for
- (A) parallel flow heat exchanger
 (B) counter flow heat exchanger
 (C) cross flow heat exchanger
 (D) parallel flow and cross flow heat exchangers
143. Fouling in heat exchangers increases
- (A) with increase in temperature and decrease in velocity
 (B) with increase in temperature and increase in velocity
 (C) with decrease in temperature and decrease in velocity
 (D) with decrease in temperature and increase in velocity
144. In a heat exchanger, the hot liquid enters at a temperature of 180°C and leaves at 160°C. The cooling fluid enters at 30°C and leaves at 110°C. The capacity ratio of the heat exchanger is
- (A) 0.25
 (B) 0.40
 (C) 0.50
 (D) 0.55
145. In free convection heat transfer transition from laminar to turbulent flow is governed by the critical value of the
- (A) Reynolds number
 (B) Grashoffs number
 (C) Reynolds and Grashoff number
 (D) Prandtl and Grashoff number
146. The dimensionless number in mass transfer which plays an equivalent role of Prandtl Number in heat transfer is
- (A) Nusselt number
 (B) Lewis number
 (C) Schmidt number
 (D) Grashof number
147. Moist air exists at a pressure of 1.01 bar. The partial pressure and saturation pressure of water vapour are 0.01 bar and 0.02 bar respectively. What is the relative humidity?
- (A) 50%
 (B) 100%
 (C) 25%
 (D) 10%
148. Given that Nu = Nusselt number; Re = Reynolds number; Pr = Prandtl number; Sh = Sherwood number; Sc = Schmidt number and Gr = Grashoff number. The functional relationship of the free convective mass transfer is given as.
- (A) $N_u = f(G_r, P_r)$
 (B) $S_h = f(S_c, G_r)$
 (C) $N_u = f(R_e, P_r)$
 (D) $S_h = f(R_e, S_c)$

149. The property which enables metals to be drawn into wire is

- (A) ductility (B) malleability
(C) plastic deformation (D) elastic deformation

150. Brinell hardness number is calculated by using the equation,

- (A) $BHN = \frac{2L}{\pi D} (D - \sqrt{D^2 - d^2})$ (B) $BHN = \frac{L}{\pi D} (D - \sqrt{D^2 - d^2})$
(C) $BHN = \frac{2L}{\pi d} (D - \sqrt{D^2 - d^2})$ (D) $BHN = \frac{L}{\pi d} (D - \sqrt{D^2 - d^2})$

where L = load in kg, D = dia. of ball in mm. d = dia. of indentation in mm.

151. Which of the following is non-destructive test

- (A) tensile test (B) charpy test
(C) cupping test (D) radiography test

152. Perm alloy is

- (A) a non-ferrous alloy used in aircraft industry
(B) a polymer
(C) a nickel and iron alloy having high permeability
(D) a kind of stainless steel

153. $\frac{a\sqrt{3}}{4}$ is the atomic radius of

- (A) BCC lattice (B) FCC lattice
(C) HCP lattice (D) Simple cube

154. Sum of buffer stock, reserve stock and safety stock is equal to

- (A) Reorder Level (ROL) (B) Ordering quantity
(C) Average inventory (D) Maximum inventory

155. Phenol and formaldehyde and polymerized to produce
 (A) Bakelite (B) Polyester
(C) PVC (D) Polyethylene
156. The most inexpensive non-destructive method of material testing is
 (A) Dye penetrant testing (B) Ultrasonic testing
(C) X-ray testing (D) Visual testing
157. Corrosion resistance of steel is increased by addition of
(A) phosphorous and vanadium (B) chromium and nickel
(C) sulphur and lead (D) tungsten and vanadium
158. Austempering of steels results in greater,
(A) hardness (B) toughness
(C) brittleness (D) ductility
159. Delta iron occurs at the temperature,
(A) above recrystalliation temperature
(B) above melting point
 (C) between 1400°C and 1539°C
(D) between 910°C and 1400°C
160. Among the following materials, the most suitable material for with standing shock and vibration without danger of cracking is
(A) chilled cast iron (B) gray cast iron
 (C) malleable cast iron (D) white cast iron
161. Filler is used in plastics to
(A) completely fill up the voids created during manufacturing
(B) improve plasticity, strength and toughness
 (C) provide colour, strength, impact resistance and reduce cost
(D) to accelerate the condensation and polymerisation

162. In straight polarity welding

- (A) electrode holder is connected to the negative and the work to positive lead
- (B) electrode holder is connected to the positive and the work to negative lead
- (C) electrode holder is to be earthed and the work to positive lead
- (D) electrode holder is connected to the negative lead and the work is to be earthed

163. Hot tear is a

- (A) hot working process
- (B) welding defect
- (C) casting defect
- (D) forging defect

164. The relationship between tool life (T) and cutting speed (V) m/min is expressed as

- (A) $V^n T = C$
- (B) $VT^n = C$
- (C) $\frac{V^n}{T} = C$
- (D) $\frac{T^n}{V} = C$

Where C is a constant, n is an exponent depends on tool and work piece

165. The operation of cutting a work piece after it has been machined to the desired shape and size

- (A) tapping
- (B) undercutting
- (C) parting-off
- (D) counter boring

166. Lapping is

- (A) the operation of sizing and finishing a small diameter hole by removing a very small amount of material
- (B) the operation of making a cone-shaped enlargement of the end of a hole
- (C) the operation of smoothing and squaring the surface around a hole
- (D) the operation of enlarging the end of a hold cylindrically

167. For resistance spot welding of 1.5 mm thick steel sheets, the current required is in the order of
- (A) 10 A (B) 100 A
(C) 1000 A (D) 10000 A
168. A cylindrical blind riser with diameter 'd' and height 'h' is placed on the top of mold cavity of a closed type sand mold. If the riser is of constant volume, then the rate of solidification in the riser is the least when the ratio h/d is
- (A) 1 : 2 (B) 2 : 1
(C) 1 : 4 (D) 4 : 1
169. In an orthogonal cutting operation, the length of the cut is 76 mm, length of the chip measured is 61 mm and depth of cut is 0.2 mm. What is the thickness of the chip?
- (A) 0.01 mm (B) 0.8 mm
(C) 0.2 mm (D) 0.25 mm
170. Cutting tool is much harder than the work piece. Yet the tool wears out during the tool-work interaction, because
- (A) extra hardness is imparted to the work piece due to coolant used
(B) oxide layers formed on the work piece surface impart extra hardness to it
(C) extra hardness is imparted to the work piece due to severe rate of strain
(D) vibration is induced in the machine tool
171. An aluminium cube of 12 cm side has to be cast along a cylindrical riser of height equal to its diameter. The riser is not insulated on any surface. If the volume shrinkage of aluminium during solidification is 6 percent, calculate shrinkage volume on solidification
- (A) 72 cm³ (B) 103.68 cm³
(C) 1728 cm³ (D) 1624.32 cm³

172. Which of the following gives an idea about the ability of the equipment to detect small variation in the input signal
- (A) readability
 - (C) sensitivity
 - (B) accuracy
 - (D) precision
173. The two slip gauges in precision measurement are joined by
- (A) assembling
 - (B) sliding
 - (C) adhesion
 - (D) wringing
174. According to Taylor's principle, No Go gauge checks
- (A) only one feature at a time
 - (B) only important dimensions at a time
 - (C) all the dimensions at a time
 - (D) only the related dimensions at a time
175. Precision is
- (A) the repeatability of a measuring process
 - (B) arrangement of a measurement with true value
 - (C) the ability of measuring device to detect small differences
 - (D) the ability of an instrument to reproduce same reading under identical conditions
176. Variable Head flow meters can be used for measurement of flow of
- (A) liquids only
 - (B) liquids and gases
 - (C) slurries only
 - (D) liquids, gases and slurries
177. Rotameter is a
- (A) drag force flow meter
 - (B) variable area flow meter
 - (C) variable head flow meter
 - (D) rotating propeller type flow meter

178. Piezo electric type of load cells can be used for measurement of
- (A) dynamic forces only
 - (B) dynamic forces and static forces provided the load cells have a small time constant
 - (C) dynamic forces and static forces provided that the load cells have a large time constant
 - (D) static forces only
179. Choose the wrong statement :
- (A) CNC computers control only one machine while DNC computers control many machines using local networking
 - (B) CNC computer is an integrated part of the machine whereas DNC computer is located at a distance from the machine
 - (C) DNC computers are having higher processing power than CNC computers
 - (D) DNC software does not take care of management of information flow to a group of machines.
180. In Retrieval CAPP systems,
- (A) No standard manufacturing plans are stored
 - (B) A standard process plan is stored in computer files for each part code number
 - (C) Engineering drawing specifications are translated into computer interpretable data
 - (D) Manufacturing plans are prepared
181. Which of the following is not a robot programming method?
- (A) Manual programming method
 - (B) Walk through programming method
 - (C) Teach pendant method
 - (D) Numerical programming method

182. The roles of rover operator in CIM system are
- (A) the supervision of other Human Resources in the system
 - (B) making the tools ready for production
 - (C) setting up the fixtures, pallets and tools for the system
 - (D) reacting to unscheduled machine shops, identifying broken tools and tool adjustments
183. In work cell control, checking the continuation of work cycle is known as
- (A) interlock
 - (B) bottleneck
 - (C) automatic lock
 - (D) check point
184. _____ condition exist when the thickness dimension is much smaller than the length and width dimension of a solid
- (A) plane strain
 - (B) plane stress
 - (C) plane tension
 - (D) axi-symmetric
185. These are the element having no internal node
- (A) Lagrange elements
 - (B) Serendinity elements
 - (C) Cubic elements
 - (D) Symmetric element
186. Most of FEM software use
- (A) displacement method
 - (B) force method
 - (C) skyline method
 - (D) stress method
187. In optiz coding schemes the following digit sequence is used. 12345 6789 ABCD. The digit 6789 represent for
- (A) form code
 - (B) secondary code
 - (C) supplementary code
 - (D) primary code

188. Which of the following are correct

1. [B] matrix relates strain and displacement vector
2. [B] matrix expressed as shape function
3. [B] matrix is square matrix
4. The size of [B] matrix depends on number of field variable and degrees of freedom

- (A) 1 only (B) 2 only
 (C) 1, 2 and 4 (D) 2, 3 and 4

189. Work study is concerned with

- (A) motivation of workers
 (B) improving present method and determining the standard time
(C) improving production capability
(D) improving production planning and control

190. One Time Measurement Unit (TMU) in method Time Measurement System equals

- (A) 0.6 minute (B) 0.06 minute
 (C) 0.006 minute (D) 0.0006 minute

191. Which one of the following cannot be considered as an example of external motivation factors?

- (A) bonus (B) fear of loss of job
(C) praise (D) self interests

192. The time by which the activity completion time can be delayed without affecting the start of succeeding activities, is called

- (A) interferred float (B) total float
 (C) free float (D) duration

193. The lead time consumption is 500 units. The annual consumption is 8000 units. The company has a policy of EOQ ordering and maintenance of 200 units as safety stock. The Reorder Point (ROP) is
- (A) 700 units
 - (B) 500 units
 - (C) 200 units
 - (D) 8000 units
194. The order in which different jobs are being taken up in the machine or process is called
- (A) sequencing
 - (B) scheduling
 - (C) routing
 - (D) aggregate planning.
195. A SIMO chart should be used with
- (A) Therbligs
 - (B) Process chart
 - (C) Flow chart
 - (D) String diagram
196. Free float in CPM method is computed by
- (A) subtracting the total float from Head event slack
 - (B) subtracting the head event slack from total float
 - (C) subtracting the tail event slack from total float
 - (D) difference between total float and independent float



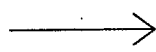

197. ABC corporation has got a demand for particular part at 10,000 units/year. The cost per unit is Rs.2 and it costs Rs.36 to place an order and to process the delivery. The inventory carrying cost is estimated at 9% of average inventory investment. Determine the EOQ.

- (A) 1000 units
- (B) 2000 units
- (C) 3000 units
- (D) 4000 units

198. Which one of the following is not a symptom of bad material handling?

- (A) accumulation of work-in-process and materials in different locations
- (B) lower investment in inprocess inventory
- (C) reworking and rejections due to handling defects
- (D) crowded floor space with scrap and materials

199. In PERT and CPM network, activity is represented by

- (A) 
- (B) 
- (C) 
- (D) 

200. Simplex method is used for carrying out

- (A) network analysis
- (B) queuing theory
- (C) linear programming
- (D) value engineering

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