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SET

Booklet No. :

ME - 16

Mechanical Engineering

Duration of Test : 2 Hours **Max. Marks : 120**

Hall Ticket No.

Name of the Candidate : _____

Date of Examination : _____ **OMR Answer Sheet No. :** _____

_____ _____

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INSTRUCTIONS

1. This Question Booklet consists of **120** multiple choice objective type questions to be answered in **120** minutes.
2. Every question in this booklet has 4 choices marked (A), (B), (C) and (D) for its answer.
3. Each question carries **one** mark. There are no negative marks for wrong answers.
4. This Booklet consists of **16** pages. Any discrepancy or any defect is found, the same may be informed to the Invigilator for replacement of Booklet.
5. Answer all the questions on the OMR Answer Sheet using **Blue/Black ball point pen only.**
6. Before answering the questions on the OMR Answer Sheet, please read the instructions printed on the OMR sheet carefully.
7. OMR Answer Sheet should be handed over to the Invigilator before leaving the Examination Hall.
8. Calculators, Pagers, Mobile Phones, etc., are not allowed into the Examination Hall.
9. No part of the Booklet should be detached under any circumstances.
10. The seal of the Booklet should be opened only after signal/bell is given.

MECHANICAL ENGINEERING (ME)

1. A system of homogeneous linear equations $AX = 0$ has a nontrivial solution if

(A) $|A| = -1$ (B) $|A| \neq 0$ (C) $|A| = +1$ (D) $|A| = 0$

2. If 2, 1+2i are the eigen values of a third order matrix A, then the third eigen value is

(A) $1-2i$ (B) $1+i$ (C) $2+3i$ (D) $1/2$

3. If $f(x) = (x-1)(x-2)$ satisfy Lagrange Mean Value theorem at c in the interval [1,3], then $c =$

(A) 3 (B) 1 (C) 2 (D) 0

4. If $x = r\cos\theta$, $y = r\sin\theta$, z = z, then the value of $\dfrac{\partial(x,y,z)}{\partial(r,\theta,z)} =$

(A) r^2 (B) $\dfrac{1}{r}$ (C) $r\tan\theta$ (D) r

5. If $y = cx - c^3$ is the general solution of the differential equation

(A) $y'' - xy' - y = 0$ (B) $(y')^3 - xy' + y = 0$

(C) $y''' - xy' - y = 0$ (D) $y' = 0$

6. The complementary function of $y'' - 2y' + y = x^2 e^x \cos x$ is

(A) $c_1\cos x + c_2\sin x$ (B) $c_1 e^x + c_2 e^{-x}$

(C) $(c_1 x + c_2)e^x$ (D) $(c_1 x + c_2)xe^x$

7. If X is a Poisson distributed variable and $P(X=0) = \dfrac{1}{e^2}$, then the probability distribution function is

(A) $\dfrac{e^{-2}2^x}{x!}$ (B) $\dfrac{e^{-3}3^x}{x!}$ (C) $\dfrac{2^x}{x!}$ (D) $\dfrac{1}{x!}$

8. If the mean and variance of a binomial distribution are 4 and 3 respectively, then the probability distribution is

(A) $C_x^8\left(\frac{3}{4}\right)^x\left(\frac{1}{4}\right)^{8-x}$ (B) $C_x^{16}\left(\frac{3}{4}\right)^x\left(\frac{1}{4}\right)^{16-x}$

(C) $C_x^8\left(\frac{1}{4}\right)^x\left(\frac{3}{4}\right)^{8-x}$ (D) $C_x^{16}\left(\frac{1}{4}\right)^x\left(\frac{3}{4}\right)^{16-x}$

9. One root of the equation $f(x) = 2x^2 - 5x + 2 = 0$ lies in the interval

(A) (0,1) (B) (1,2) (C) (−1,0) (D) (−2,0)

10. The method of successive approximation $x_{k+1} = \phi(x_k)$ converges if

(A) $|\phi'(x)| < 1$ (B) $|\phi'(x)| > 1$ (C) $|\phi''(x)| > 0$ (D) $|\phi'(x)| < 2$

11. Equilibrium of a rigid body under a system of forces signifies the condition in which the resultant force system is

(A) Positive (B) Negative
(C) Zero (D) Either Positive or Negative or Zero

12. The coefficient of friction between a large stationary body and a small moving body is maximum when the small body is

(A) static (B) about to come to halt
(C) about to move (D) in uniform motion

13. A cylindrical disk of mass 8 kg and diameter 1 m is rolling without slipping on a stationary flat surface. The moment of inertia of the disk about its instantaneous center of rotation is

(A) 4 kg.m^2 (B) 3 kg.m^2 (C) 2 kg.m^2 (D) 1 kg.m^2

14. The velocity of a particle in rectilinear motion is given by V = $2t^3 - 3t^2$ m/sec. Its acceleration after 2 seconds is

(A) 8 m/s^2 (B) 15 m/s^2 (C) 21 m/s^2 (D) 12 m/s^2

15. A gear wheel of pitch diameter 1 m has constant angular acceleration of 6 rad/s^2. The tangential acceleration of a point on its pitch circle is

(A) 6.0 rad/s^2 (B) 3.0 m/s^2 (C) 5.0 m/s^2 (D) 6.0 m/s^2

16. Two bodies of masses M = 2 kg and m = 1 kg are connected by a light inextensible string passing over a smooth pulley. Mass m lies on smooth horizontal plane and mass M is hanging in air. If mass M is moving down then the acceleration of the system is (g is gravitational acceleration)

(A) g (B) 2g (C) 2g/3 (D) 3g/2

17. A body of mass 5 kg is moving at a speed of 10 m/s on a frictionless surface. It collides with another body of mass 10 kg moving in the same direction at 5.5 m/s. Both the bodies move together as a single entity with same velocity after collision. What is the final velocity of the system after the collision ?

(A) 5.5 m/sec (B) 7 m/sec (C) 7.8 m/sec (D) 10 m/sec

18. The state of stress at a point in an elastic body is a

(A) Scalar
(B) Vector
(C) Tensor
(D) Any of the above depending on the shape of the body

19. In a structural element made of linear elastic material
(A) Stiffness is directly proportional to flexibility.
(B) Stiffness is inversely proportional to flexibility.
(C) Stiffness is equal to flexibility.
(D) Stiffness and flexibility are not related.

20. In a shaft under pure torsion the shear stress is given as 100 MPa. The principle stresses are
(A) +100, –100 (B) +50, –50 (C) 0, 100 (D) +200, –200

21. Pick the incorrect statement from the following four statements:
(A) On the plane which carries maximum normal stress, the shear stress is zero.
(B) Principle planes are mutually orthogonal.
(C) On the plane, which carries maximum shear stress, the normal stress is zero.
(D) The principle stress axes and principle strain axes coincide for an isotropic material.

22. A cantilever beam is subjected to a couple at its free end. Labeling BM for Bending Moment and SF for shear force.
(A) In any part of the beam BM is Constant and SF is Zero
(B) In any part of beam SF is Constant and BM is Zero
(C) SF varies linearly and BM has parabolic variation
(D) BM varies linearly and SF has parabolic variation

23. A simply supported beam has its longitudinal axis parallel to X-axis. It is subjected to transverse load parallel to Y-axis. The width of the beam measured parallel to Z-axis is double the thickness measured parallel to Y-axis. The neutral axis of the beam is parallel to
(A) X axis (B) Y axis (C) Z axis (D) Either X or Y axis.

24. A solid cylindrical shaft has stiffness 'K'. The shaft is replaced by a hallow shaft such that the outer diameter D_0 remains same as that of the solid shaft and inner diameter D_i is one fourth of the outer diameter (ie. $D_i=0.25\ D_o$). Rest of the variables remains unaltered. The stiffness of the hallow shaft is ?
(A) $\frac{255K}{256}$ (B) $\frac{63K}{64}$ (C) $\frac{3K}{4}$ (D) $\frac{15K}{16}$

25. A planar mechanism consists of 8 links, 8 turning pairs and 2 sliding pairs. The number of degrees of freedom for the mechanism is
(A) 0 (B) 1 (C) 2 (D) –1

26. In a special Grashoff's four bar mechanism the input and output links are equal and longer while the coupler and fixed links are equal and shorter. When both the input and output links are perpendicular to the fixed link the velocity ratio is
(A) ≤ 0 (B) >1 (C) $= 1$ (D) Infinity

27. An open chain planar mechanism has one turning pair and one sliding pair. A slender link rotates at N rpm with respect to the fixed link while the slider reciprocates along the axis of the slender link with a velocity of V m/sec. The Coriolis acceleration of the sliding link is

(A) 0 (B) 2NV (C) π NV/30 (D) π NV/15

28. In a mechanical system a flywheel controls the fluctuations of torque produced by the prime mover. Keeping everything same the flywheel is replaced by another one having the same mass as the original one but double the diameter. The coefficient of fluctuation of speed will be

(A) Reduced to 25 % (B) Increases by 100 %
(C) Remains same (D) Reduced to 50 %

29. The control force for a spring loaded governor is given by a liner equation F= a r + b, Where F is the control Force, r is the radius of rotation for the balls, a and b are constants. The condition for a stable governor is

(A) $a < 0$ & $b < 0$ (B) $a > 0$ & $b > 0$ (C) $a > 0$ & $b < 0$ (D) $a < 0$ & $b > 0$

30. In a single cylinder IC engine when the magnitude of the primary unbalanced force becomes maximum and the magnitude of the secondary unbalanced force will be

(A) Minimum (B) Maximum
(C) Either Minimum or Maximum (D) Neither Minimum nor Maximum

31. Minimum number of teeth required to avoid interference on a 20° involute pinion engaging with a gear wheel of any number of teeth must be at least

(A) 32 (B) 18 (C) 15 (D) 12

32. In an automobile with a regular type differential gear the speeds of the inner and outer wheels are 60 rpm and 62 rpm respectively. The speed of the crown wheel will be

(A) 60 rpm (B) 61 rpm
(C) 62 rpm (D) Can't say with the given data

33. In a spring mass vibrating system while the mass pass through the mean position

(A) Acceleration is maximum and Velocity is Zero
(B) Acceleration is Zero and Velocity is minimum
(C) Acceleration is minimum and Velocity is Zero
(D) Acceleration is Zero and Velocity is maximum

34. An undamped simple pendulum vibrates in the vertical plane, when the bob is at its mean position the net force on the bob is

(A) Zero (B) In the direction of motion
(C) Opposite to the direction of motion (D) Upwards

35. A spring mass damper system has M = 1 kg, C = 2 N.sec/m and K = 4 N/m. What is the damping ratio ?

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

36. A spring mass damper system has M = 1 kg, C = 2 N.sec/m and K = 4 N/m. What is the magnification factor when the excitation frequency is 2 rad/sec ?
(A) 1 (B) Infinity (C) 2 (D) 0.5

37. An automobile travels on a rough road whose profile can be approximated as a harmonic curve with amplitude of 0.1 m and wavelength 10 m/sec. when the vehicle travels along the road with a velocity of 10 m/sec. Modeling this as a support motion problem what is the excitation frequency ?
(A) π rad/sec (B) 2π rad/sec (C) $10\,\pi$ rad/sec (D) $20\,\pi$ rad/sec

38. A slender shaft supported in short bearings has a critical speed N rpm. When the short bearings are replaced with long bearings the critical speed will be
(A) N (B) 2 N (C) 4 N (D) N/2

39. In the design of machine components if the factor of safety is increased it leads to the reduction in
(A) Size (B) Cost (C) Induced Stress (D) All the above.

40. A component made of brittle material subjected to pure shear fails
(A) by yielding when $\tau_{max} = S_{yt}$ (B) by fracture when $\tau_{max} = S_{yt}/2$
(C) by fracture when $\tau_{max} = S_{ut}/2$ (D) by yielding when $\tau_{max} = S_{ut}/2$

41. The relationship between notch sensitivity factor (q), theoretical stress concentration factor (k_t) and fatigue (or) form stress concentration (k_f) is given by
(A) $q = \frac{k_f}{k_t}$ (B) $q = \frac{k_t - 1}{k_f - 1}$ (C) $q = \frac{k_f - 1}{K_t - 1}$ (D) $q = \frac{k_f + 1}{k_f + 1}$

42. For the combination of radial load and thrust load the best bearing among the following is
(A) Needle bearing (B) Spherical roller bearing
(C) Cylindrical roller bearing (D) Journal bearing

43. Effect of increasing stiffness of springs in a centrifugal clutch leads to
(A) Increase in speed of engagement
(B) Increase in friction torque at maximum speed
(C) Decrease the effort for disengagement
(D) All the above

44. A brake is said to be self-energizing when
(A) External force is not necessary to operate the brake
(B) Huge external force is required to disengage the brake
(C) The breaking force and the friction force induce moment in the same direction
(D) The breaking force and the friction force induce moment in opposing directions

45. A double fillet welded joint with parallel fillet weld of length L and leg a is subjected to a tensile force P. Assuming uniform stress distribution, the shear stress in the weld is
(A) $(\sqrt{2}\,P)/aL$ (B) $P/\sqrt{2}\,aL$ (C) P/aL (D) 2P/aL

46. Mercury does not wet the glass. This is due to the property of the liquid, known as
(A) Cohesion (B) Surface tension
(C) Adhesion (D) Viscosity

47. A fluid in equilibrium can't sustain
(A) Shear stresses (B) Tensile stresses
(C) Compressive stresses (D) Bending stresses

48. Choose the wrong statement
(A) Viscosity of the fluid is that property which determines the amount of its resistance to a shearing force.
(B) Viscosity of liquids decreases with increase in temperature.
(C) Viscosity is due primarily to interaction between fluid molecules.
(D) Viscosity of the liquid is appreciably affected by change in pressure.

49. When a body floating in a liquid, is displaced slightly then it oscillates about
(A) Center of pressure (B) Center of buoyancy
(C) Meta center (D) Gravitational center

50. In a free vortex motion, the radial component of velocity everywhere is
(A) Zero (B) Maximum (C) Minimum (D) Non-zero and finite

51. The velocity profile for turbulent flow through a closed conduit is
(A) Linear (B) Parabolic (C) Hyperbolic (D) Logarithmic

52. Boundary layer separation is caused by the
(A) Adverse pressure gradient.
(B) Reduction of pressure gradient to zero.
(C) Boundary layer thickness reducing to zero.
(D) Reduction of pressure to vapour pressure.

53. The temperature in isentropic flow
(A) Depends on Mach number only.
(B) May or may not depends on Mach number.
(C) Does not depend on Mach number.
(D) Can't say

54. Which of the following is not a dimension-less parameter ?
(A) Euler number (B) Fanning friction factor
(C) Specific gravity (D) None of the above

55. A piece of metal of specific gravity 7 floats in mercury of specific gravity 13.6. What fraction of it will under mercury ?
(A) About 0.4 (B) About 0.6 (C) About 0.5 (D) About 0.65

56. According to kinetic theory of gases, the absolute zero temperature can be attained when

(A) Volume of gas is zero
(B) Kinetic energy of molecules is zero
(C) Specific heat of gas is zero
(D) Mass is zero

57. Which of the following is correct ?

(A) Only gases have two values of specific heat.
(B) Both gases and liquids have two values of specific heat.
(C) Specific heat value is constant irrespective of state of substance.
(D) Only liquids have two values of specific heat.

58. A heat exchange process in which product of pressure and volume remains constant is known as

(A) Adiabatic process
(B) Throttling process
(C) Isentropic process
(D) Hyperbolic process

59. The absolute temperature of an ideal diatomic gas is quadrupled. What happens to the average speed of molecules ?

(A) Quadruples
(B) Doubles
(C) Triples
(D) Increases by a factor of 1.41

60. A 1 kg block of ice at 0 ºC is placed into a perfectly insulated, sealed container that has 2 kg of water also at 0 ºC. The water and ice completely fill the container, but the container is flexible. After some time one can except that

(A) The water will freeze so that the mass of the ice will increase.
(B) The ice will melt so that the mass of the ice will decrease.
(C) Both the amount of water and the amount of ice will remain constant.
(D) Both the amount of water and the amount of ice will decrease.

61. Which of the following is correct ?

(A) Both Stirling and Ericson cycle are reversible.
(B) Both Stirling and Ericson cycle are irreversible.
(C) Neither Stirling and Ericson cycle are reversible.
(D) Stirling cycle is reversible and Ericson cycle is irreversible.

62. Read the following Statements:

(i) Otto cycle efficiency is higher than Diesel cycle efficiency for the same compression ratio and heat input because in Otto cycle combustion is at constant volume.
(ii) Otto cycle efficiency is higher than Diesel cycle efficiency for the same compression ratio and heat input because in Otto cycle maximum temperature is higher.
(iii) Otto cycle efficiency is higher than Diesel cycle efficiency for the same compression ratio and heat input because in Otto cycle heat rejection is lower.

(A) Only (i) is correct
(B) Both (i) and (iii) are correct
(C) Only (iii) is correct
(D) Both (ii) and (iii) are correct.

63. Read the following Statements:

(i) Thermal conductivity of air with rise in temperature increases.

(ii) Thermal conductivity of non-metallic amorphous solids with decrease in temperature decreases.

(iii) Thermal conductivity of solid metals with rise in temperature normally increases.

(A) All (i), (ii) and (iii) are correct (B) Only (i) and (iii) are correct

(C) Only (ii) and (iii) are correct (D) Only (i) and (ii) are correct

64. The concept of overall heat transfer coefficient is used in heat transfer problem of

(A) Conduction and convection (B) Conduction and radiation

(C) Convection and radiation (D) Conduction, convection and radiation

65. Which of the following statement is correct pertaining to thermal diffusivity ?

(A) It is a function of temperature

(B) It is inversely proportional to thermal conductivity

(C) It is property of material

(D) It is a dimensionless parameter

66. In free convection heat transfer transition from laminar to turbulent flow is governed by the critical value of the

(A) Prandtl number, Grashoff's number

(B) Reynold's number, Grashoff's number

(C) Reynold's number, Prandtl number

(D) Reynold's number

67. The by-pass factor for a cooling coil

(A) May increase or decrease with increase in velocity of air passing through it depending upon the condition of air entering.

(B) Decreases with increase in velocity of air passing through it.

(C) Increases with increase in velocity of air passing through it.

(D) Remains unchanged with increase in velocity of air passing through it.

68. Which of the following statement is correct ?

(A) The minimum temperature to which water can be cooled in a cooling tower is wet bulb temperature.

(B) The minimum temperature to which water can be cooled in a cooling tower is dew point temperature of air.

(C) The minimum temperature to which water can be cooled in a cooling tower is ambient temperature of air.

(D) The minimum temperature to which water can be cooled in a cooling tower is dry bulb temperature of air.

69. Stanton number is defined as

(A) The ratio of Prandtl number and the product of Nusselt number and Reynold's number.

(B) The ratio of Prandtl number and the product of Nusselt number and Raleigh's number.

(C) The ratio of Reynold's number and the product ofNusselt number and Prandtl number.

(D) The ratio of Nusselt number and the product of Reynold's number and Prandtl number.

70. The radial heat transfer rate through hollow cylinder increases as the ratio of outer radius to inner radius

(A) Decreases (B) Increases

(C) Constant (D) May increase or decrease

71. Which of the following statements is correct ?

(A) High value of Prandtl number indicates Rapid heat transfer by forced convection to natural convection.

(B) High value of Prandtl number indicates Rapid diffusion of momentum by viscous action compared to diffusion of energy.

(C) High value of Prandtl number indicates relative heat transfer by conduction to convection.

(D) High value of Prandtl number indicates relative heat transfer by radiation to convection.

72. Which of the following is not true pertaining to four stroke internal combustion engine ?

(A) Because of one power stroke in two revolutions, lesser cooling and lubrication requirement, thus lesser rate of wear and tear compared to two stroke cycle engine.

(B) High initial cost compared to two stroke cycle engine

(C) Volumetric efficiency lesser compared to two stroke cycle engine, due to less time available for induction.

(D) Part load efficiency is better than two stroke cycle engine.

73. Mechanical efficiency of the internal combustion engine is defined as

(A) Ratio of indicated work to the energy supplied by the fuel.

(B) Ratio of shaft work obtained to the energy supplied by the fuel.

(C) Ratio of power obtained at the shaft to the indicated power.

(D) Ratio of power obtained at the shaft to the actual volume inhaled during suction stroke.

74. Read the following Statements:

(i) Regenerative cycle thermal efficiency is always greater than simple Rankine cycle.

(ii) The maximum percentage gain in Regenerative feed heating cycle thermal efficiency, increases with more number of feed heaters.

(iii) In a regenerative feed heating cycle, the optimum value of fraction of steam extracted for feed heating decreases with increase in Rankine cycle efficiency.

(A) Only (i) and (ii) are correct (B) Only (i) and (iii) are correct

(C) All above statements are correct (D) Only (ii) and (iii) are correct.

75. The work output of theoretical Otto cycle
(A) Increases with increase in adiabatic index
(B) Decreases with increase in pressure ratio
(C) Decreases with increase in compression ratio
(D) None of the above

76. The overall efficiency of a reaction turbine is the ratio of
(A) Work done on the wheel to the energy (or head of water) actually supplied to the turbine
(B) Actual work available at the turbine to the energy imparted to the wheel
(C) Power produced by the turbine to the energy imparted to the wheel
(D) Power produced by the turbine to the energy actually supplied by the turbine

77. Any change in load is adjusted by the adjusting the following parameter on turbine
(A) Blade velocity (B) Flow
(C) Net head (D) Relative velocity at the inlet

78. The specific speed of a turbine is the speed of an imaginary turbine, identical with the given turbine, which
(A) Develops unit power under unit head
(B) Delivers unit discharge under unit head
(C) Delivers unit discharge under unit speed
(D) Develops unit power under unit speed

79. Choose the wrong statement
(A) Energy is said to be degraded each time it flows through a finite temperature difference.
(B) To increase work capacity of energy transferred by heat transfer from high temperature to low temperature, temperature difference should be increased.
(C) The actual work which a system does is always less than the reversible work.
(D) None of the above.

80. Freezing temperature of water decreases with
(A) None of the following (B) Increases or decreases with pressure
(C) Decrease in pressure (D) Increase in pressure

81. Alloy steel which is work hardenable and which is used to make the blades of bulldozers, bucket wheel excavators and other earth moving equipment contain iron, carbon and
(A) Chromium (B) Silicon (C) Manganese (D) Magnesium

82. During tensile testing of a specimen using universal testing machine, the parameters actually measured include
(A) True stress and true strain
(B) Poisson's ratio and Young's modulus
(C) Engineering stress and engineering strain
(D) Load and elongation

83. Heating the hypo-eutectoid steels to 30 °C above the upper critical temperature line, soaking at the temperature and then cooling slowly to room temperature to form a pearlite and ferrite structure, is known as
(A) Hardening (B) Normalizing (C) Tempering (D) Annealing

84. In case of power screws, what is the combination of materials used for the screw and nut
(A) Cast iron screw and mild steel nut
(B) Carbon steel screw and phosphor bronze nut
(C) Cast iron screw and cast iron nut
(D) Aluminium screw and alloy steel nut

85. Vibration damping in machinery is best achieved by means of base structure made of which one of the following material ?
(A) Low carbon steel (B) Nodular iron
(C) Grey cast iron (D) White cast iron

86. Gray cast iron blocks 200 × 100 × 10 mm are to be cast in sand moulds. Shrinkage allowance for pattern making is 1 %. The ratio of the volume of pattern to that of the casting will be
(A) 0.97 (B) 0.99 (C) 1.01 (D) 1.03

87. Bottom gating system is some times preferred in casting because
(A) It enables rapid filling of mould cavity
(B) It is easier to provide in the mould
(C) It provides cleaner metal
(D) It reduces splashing and turbulence

88. Misrun is a casting defect which occurs due to
(A) A very high pouring temperature of the metal
(B) Insufficient fluidity of the molten metal
(C) Absorption of gases by the liquid metal
(D) Improper alignment of the mould flasks

89. Which of the following are produced by slush casting ?
(A) Hollow castings with thick walls (B) Hollow castings with thin walls
(C) Thin castings (D) Thick castings

90. Which one of the following processes consists of central sprue to feed metal into cavities through a number of radial gates
(A) Centrifuging (B) Semi-centrifugal casting
(C) True centrifugal casting (D) Precision casting

91. In rolling a strip between two rolls, the position of the neutral point in arc of contact does not depends on
(A) Amount of reduction (B) Diameter of rolls
(C) Coefficient of rolls (D) Materials of rolls

92. In open die forging a disc of diameter 200 mm and height 60 mm is compressed without any barreling effect, the final diameter of disc is 400 mm the true strain is
(A) 1.986 (B) 1.686 (C) 1.386 (D) 0.602

93. The operation in which oil is permeated into the pores of powder metallurgy product is known as
(A) 0.97 (B) 0.99 (C) 1.01 (D) 1.03

94. Which one of the following manufacturing processes requires the provision of gutters
(A) closed die forging (B) centrifugal casting
(C) investment casting (D) impact extrusion

95. The collapsible tooth paste tubes are manufactured by
(A) direct extrusion (B) piercing
(C) impact extrusion (D) indirect extrusion

96. In which one of the following welding techniques is vacuum environment is required ?
(A) Ultrasonic welding (B) Laser beam welding
(C) Plasma arc welding (D) Electron beam welding

97. High alloy steel components are preheated before welding for reducing
(A) heat affected zone (B) total energy consumption
(C) total time of welding (D) welding stresses

98. Which one among the following welding processes uses non-consumable electrode ?
(A) Gas metal arc welding (B) Submerged arc welding
(C) Gas tungsten arc welding (D) Flux coated arc welding

99. The type of coated electrode most widely used for welding low carbon steels
(A) Cellulose (B) Acidic (C) Rutile (D) Oxide

100. The strength of a brazed joint
(A) decreases with increase in gap between the joining surfaces.
(B) increases with increase in gap between the two joining surfaces.
(C) decreases up to certain gap between the joining surfaces beyond which it increases.
(D) increases up to certain gap between the joining surfaces beyond which it decreases.

101. In orthogonal cutting, the feed is 0.5 mm at a cutting speed of 2 m/sec. If the chip thickness is 0.75 mm, the chip velocity is: (consider the rake angle as zero)
(A) 1.33 m/sec (B) 2 m/sec (C) 2.5 m/sec (D) 3 m/sec

102. The percentage of total energy dissipated due to friction at the tool chip interface is
(A) 30 (B) 42 (C) 58 (D) 70

103. The indexing of the turret in a single spindle lathe is done using
(A) Geneva mechanism (B) Ratchet and Pawl mechanism
(C) Rack and pinion mechanism (D) Whit worth mechanism

104. In a tool life test, doubling the cutting speed reduces the tool life to one fourth of the original. The Taylor's tool life index is
(A) ½ (B) 1/3 (C) ¼ (D) 1/7

105. 3-2-1 method of location in jig or fixture would collectively restrict the work piece in 'n' degree of freedom, where the value of 'n' is
(A) 6 (B) 8 (C) 9 (D) 12

106. In an engineering drawing one finds the designation of 20G7f8, the position of tolerance of the hole is indicated by
(A) Letter G (B) Letter f (C) Number 7 (D) Number 8

107. For angle measurement in metrology, the following pair can be used in conjunction with each other
(A) sine bar and Vernier calipers (B) bevel protractor and slip gauge
(C) slip gauge and sine bar (D) sine bar and bevel protractor

108. A small bore is designated 25H7. The lower (minimum) and upper (maximum) limits of the bore are 25.00 mm and 25.021 respectively. When the bore is designated as 25H8, then the upper limit is 25.033 mm. When the bore is designated as 25H6, then the upper limit of the bore in mm is
(A) 25.001 (B) 25.005 (C) 25.009 (D) 25.013

109. The geometric tolerance that does not need a datum for its specification is
(A) Concentricity (B) Run out
(C) Perpendicularity (D) Flatness

110. In a CNC feed drive, a stepper motor with step angle of 1.6 degrees drives a lead screw with pitch of 2 mm. The basic length unit for this drive is
(A) 10 microns (B) 20 microns (C) 40 microns (D) 100 microns

111. Machining of complex shapes on CNC machines requires
(A) Simultaneous control of x, y, z axes
(B) Simultaneous control of x, y axes
(C) Independent control of x, y, z axes
(D) Independent control of x, y axes

112. For generating a coons surface we require
(A) a set of grid points on the surface
(B) a set of grid control points
(C) four bounding curves defining surface
(D) two bounding curves and a set of grid control points

113. Cellular manufacturing is suitable for
(A) a single production in large volumes
(B) one-off production of several varieties
(C) production with similar features made in batches
(D) large variety of products in large volumes

114. If the demand for an item is doubled and the ordering cost halved, the economic order quantity

(A) remains unchanged (B) increased by factor of $\sqrt{2}$

(C) is doubled (D) is halved

115. A company has an annual demand of 1000 units, ordering cost of ₹ 100 order, and carrying cost of ₹ 100 unit-year. If the stock out costs are estimated to be nearly ₹ 400 each time the company runs out-of-stock, the safety stock justified by the carrying cost will be

(A) 4 (B) 20 (C) 40 (D) 100

116. Vehicle manufacturing assembly line is an example of

(A) Product layout (B) Process layout

(C) Manual layout (D) Fixed layout

117. Production flow analysis (PFA) is a method of identifying part families that uses data from

(A) Engineering drawings (B) Production schedule

(C) Bill of materials (D) Route sheets

118. A component can be produced by any of the four processes, I, II, III and IV. Process I has fixed cost of ₹ 20 and variable cost of ₹ 3 per piece. Process II has fixed cost of ₹ 50 and variable cost of Rs. 1 per piece. Process III has fixed cost of ₹ 40 and variable cost of ₹ 2 per piece. Process IV has fixed cost of ₹10 and variable cost of ₹ 4 per piece. If company wishes to produce 100 pieces of the component, from economic point of view it should choose

(A) Process I (B) Process II (C) Process III (D) Process IV

119. A dummy activity is used in PERT network to describe

(A) Precedence relationship (B) Necessary time delay

(C) Resource restriction (D) Resource idleness

120. The project activities, precedence relationships and durations are described in the table. The critical path of the project is

Activity	Precedence	Duration (in day)
P	-	3
Q	-	4
R	P	5
S	Q	5
T	R, S	7
U	R, S	5
V	T	2
W	U	10

(A) P-R-T-V (B) Q-S-T-V (C) P-R-U-W (D) Q-S-U-W

SPACE FOR ROUGH WORK

MECHANICAL ENGINEERING (ME)

SET-A

Question No	Answer	Question No	Answer
1	D	61	A
2	A	62	C
3	C	63	D
4	D	64	A
5	B	65	C
6	C	66	A
7	A	67	C
8	D	68	A
9	A	69	D
10	A	70	A
11	C	71	B
12	C	72	C
13	B	73	C
14	D	74	A
15	B	75	A
16	C	76	D
17	B	77	B
18	C	78	A
19	B	79	B
20	A	80	D
21	C	81	C
22	A	82	D
23	C	83	D
24	A	84	B
25	B	85	C
26	C	86	A
27	D	87	D
28	A	88	B
29	C	89	B
30	B	90	A
31	B	91	D
32	B	92	C
33	D	93	C
34	A	94	A
35	D	95	C
36	A	96	D
37	B	97	D
38	C	98	C
39	C	99	C
40	C	100	D

41	C	101	A
42	B	102	A
43	A	103	A
44	C	104	A
45	A	105	C
46	B	106	A
47	A	107	C
48	D	108	D
49	C	109	D
50	A	110	A
51	D	111	C
52	B	112	C
53	A	113	C
54	D	114	A
55	C	115	C
56	B	116	A
57	A	117	B
58	D	118	B
59	B	119	A
60	B	120	D