VERSION CODE	Maximum Marks : 100 Total Duration : 150 Minutes Maximum Time For Answering : 120 Minutes Subject : **MECHANICAL SCIENCES (AE/MC/IPE/IEM/MSE)**	Serial Number : 122529
A1	**MENTION YOUR PGCET NUMBER**	Subject Code **P-MS**

P-MS – A1

DOs:

1. This question booklet is issued to you by the invigilator **after 02.20 pm.**
2. Check whether the PGCET Number has been entered and shaded in the respective circles on the OMR answer sheet.
3. The version code and serial number of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
4. The Version Code and Serial Number of this question booklet should be entered on the Nominal Roll without any mistakes.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'Ts:

1. **The timing and marks printed on the OMR answer sheet should not be damaged / mutilated / spoiled.**
2. **The 3rd Bell rings at 2.30 p.m., till then;**
   - Do not remove the seal present on the right hand side of this question booklet.
   - Do not look inside this question booklet or start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. In case of usage of signs and symbols in the questions, the regular textbook connotation should be considered unless stated otherwise.
2. This question booklet contains 75 questions and each question will have one statement and four different options / responses & out of which you have to choose one correct answer.
3. After the 3rd Bell is rung at 02.30 pm, remove the paper seal on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
4. Completely **darken / shade** the relevant circle with a **blue** or **black ink ballpoint pen against the question number on the OMR answer sheet.**

ಸರಿಯಾದ ಕ್ರಮ CORRECT METHOD				ತಪ್ಪು ಕ್ರಮಗಳು WRONG METHOD							
A	●	C	D	⊗ B	C	D	A	B	C	⊘	A ● ● D
A	●	C	D	◐ B	C	D	A	●	C	D	

5. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognized and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
6. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
7. **Last bell will ring at 4.30 pm**, stop marking on the OMR answer sheet.
8. Hand over the **OMR answer sheet** to the room invigilator as it is.
9. After separating the top sheet (KEA copy), the invigilator will return the bottom sheet replica (candidate's copy) to you to **carry home for self-evaluation.**
10. Only **Non-programmable** calculators are allowed for "M.E./M.Tech./M.Arch" examination.

Marks Distribution	
Part–A :	**(Section 1) 30 Questions: 30 x 1 = 30, (Section 2) 15 Questions: 15 x 2 = 30**
Part–B :	**(Section 1) 20 Questions: 20 x 1 = 20, (Section 2) 10 Questions: 10 x 2 = 20**

MECHANICAL SCIENCES

(Common to AE/MC/IPE/IEM/MSE)

PART – A

(SECTION –I)

Each question carries one mark. **(30 × 1 = 30)**

1. If $u = x^y$, then $\frac{\partial^2 u}{\partial x \partial y} =$ _____

   (A) $x^{y+1}(y \log x+1)$

   (B) $x^{1-y}(y \log x-1)$

   (C) $x^{y-1}(y \log x+1)$

   (D) $x^{-1-y}(y \log x+1)$

2. Laplace transform of t^3e^{-2t} is _____

   (A) $\frac{6}{(s-3)^4}$ (B) $\frac{6}{(3-s)^4}$

   (C) $\frac{6}{(s+3)^5}$ (D) $\frac{6}{(s+3)^4}$

3. If $z = (x^2 + a)(y^2 + b)$, the partial differential equation is $pq =$ _____ where $p = \frac{\partial z}{\partial x}, q = \frac{\partial z}{\partial y}$

   (A) $4(x + y + z)$ (B) $4(x^2y^2z^2)$

   (C) $4xyz$ (D) $4xyz^2$

4. In Gaussian distribution, the maximum ordinate is given by _____

   (A) $\frac{1}{\sqrt{2\pi\sigma}}$ (B) $\frac{1}{2\pi\sqrt{\sigma}}$

   (C) $\frac{1}{\pi\sqrt{2\sigma}}$ (D) $\frac{1}{\sigma\sqrt{2\pi}}$

5. If $4x-5y+33=0$ and $20x-9y-107 = 0$ are the two regression equations, the coefficient of correlation is given by $r =$ _____

   (A) 0.2 (B) 0.4

   (C) 0.6 (D) 0.8

6. Which of the following materials has maximum ductility?

   (A) Mild steel

   (B) Copper

   (C) Nickel

   (D) Aluminium

7. Shock resisting steels should have

   (A) low wear resistance

   (B) low hardness

   (C) low tensile strength

   (D) toughness

8. The percentage of carbon in cast iron varies from

   (A) 0.1 to 0.5

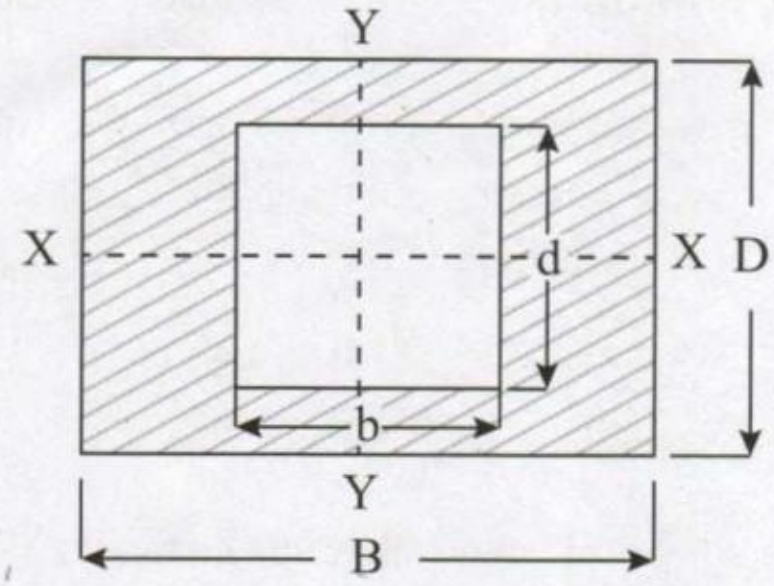
   (B) 0.5 to 1

   (C) 1 to 1.7

   (D) 1.7 to 4.5

Space For Rough Work

9. Moment of inertia of a hollow rectangular section as shown in the below figure about X-X axis, is:



(A) $(BD^3/12) - (bd^3/12)$

(B) $(DB^3/12) - (db^3/12)$

(C) $(BD^3/36) - (bd^3/36)$

(D) $(DB^3/36) - (db^3/36)$

10. The centre of gravity of a T-section 100 mm × 150 mm × 50 mm from its bottom is

(A) 50 mm

(B) 75 mm

(C) 87.5 mm

(D) 125 mm

11. Frictional force encountered after commencement of motion is

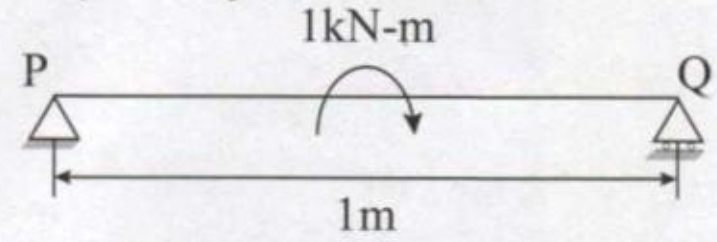
(A) Limiting friction

(B) Kinematic friction

(C) Frictional resistance

(D) Dynamic friction

12. A simply supported beam PQ is loaded by a moment of 1 kNm at the mid-span of the beam as shown in the figure. The reaction forces R_P and R_Q at supports P and Q respectively are



(A) 1 kN downward, 1 kN upward

(B) 0.5 kN upward, 0.5 kN downward

(C) 0.5 kN downward, 0.5 kN upward

(D) 1 kN upward, 1 kN upward

13. A steel bar of 40 mm × 40 mm square cross-section is subjected to an axial compressive load of 200 kN. If the length of the bar is 2 m and E = 200 GPa, the elongation of the bar will be

(A) 1.25 mm (B) 2.70 mm

(C) 4.05 mm (D) 5.40 mm

14. A concentrated load of P acts on a simply supported beam of span L at a distance L / 3 from the left support. The bending moment at the point of application of the load is given by

(A) $\frac{PL}{3}$ (B) $\frac{2PL}{3}$

(C) $\frac{PL}{9}$ (D) $\frac{2PL}{9}$

15. For a completely submerged body with centre of gravity 'G' and centre of buoyancy 'B', the condition of stability will be

(A) G is located below B

(B) G is located above B

(C) G and B are coincident

(D) Independent of the locations of G and B

Space For Rough Work

16. The flow of fluid will be laminar when
    (A) Reynold's number is less than 2000
    (B) The density of the fluid is low
    (C) Both (A) and (B)
    (D) None of the above

17. The volume and temperature of air (assumed to be an ideal gas) in a closed vessel is 2.87 m^3 and 300K respectively. The gauge pressure indicated by a manometer fitted to the wall of the vessel is 0.5 bar. If the gas constant of air is R=287 J/kg.K and the atmospheric pressure is 1 bar, the mass of air (in kg) in the vessel is
    (A) 1.67 (B) 3.33
    (C) 5.00 (D) 6.66

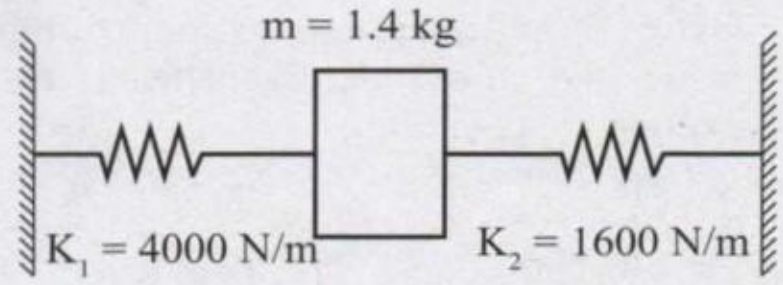
18. One kg of an ideal gas (gas constant R = 287 J/kg.K) undergoes an irreversible process from state-1 (1 bar, 300 K) to state-2 (2 bar, 300 K). The change in specific entropy (s1 – s2) of the gas (in J/kg.K) in the process is _____
    (A) –198.93 J/kg.K
    (B) –175.90 J/kg.K
    (C) –210.00 J/kg.K
    (D) –140 J/kg.K

19. One kg of air (R=287 J/kg.K) undergoes an irreversible process between equilibrium State 1 (20°C, 0.9 m^3) and equilibrium State 2 (20°C, 0.6 m^3) . The change in entropy S2 – S1 (in J/Kg.K) is
    (A) – 117.433 J/kg. K
    (B) – 234.234 J/kg. K
    (C) – 11.368 J/kg. K
    (D) – 323.343 J/kg. K

20. A reversible heat engine receives 2 kJ of heat from a reservoir at 1000 K and a certain amount of heat from a reservoir at 800 K. It rejects 1 kJ of heat to a reservoir at 400 K. The network output (in kJ) of the cycle is
    (A) 0.8 (B) 1.0
    (C) 1.4 (D) 2.0

21. Which of the following statements is INCORRECT?
    (A) Grashof's rule states that for a planar crank-rocker four bar mechanism, the sum of the shortest and longest link lengths cannot be less than the sum of the remaining two link lengths.
    (B) Inversions of a mechanism are created by fixing different links one at a time.
    (C) Geneva mechanism is an intermittent motion device.
    (D) Gruebler's criterion assumes mobility of a planar mechanism to be one.

22. The natural frequency of the spring mass system shown in the figure is closest to



    (A) 8 Hz (B) 10 Hz
    (C) 12 Hz (D) 14 Hz

Space For Rough Work

23. Which of the following statements is correct?

(A) Flywheel reduces speed fluctuations during a cycle for a constant load, but flywheel does not control the mean speed of the engine, if the load changes.

(B) Flywheel does not reduce speed fluctuation during a cycle for a constant load, but flywheel does not control the mean speed of the engine, if the load changes.

(C) Governor controls speed fluctuations during a cycle for a constant load, but governor does not control the mean speed of the engine, if the load changes.

(D) Governor controls speed fluctuations during a cycle for a constant load and governor also controls the mean speed of the engine, if the load changes.

24. Which one of the following is criterion in the design of hydrodynamic journal bearings?

(A) Sommerfeld number

(B) Rating life

(C) Specific dynamic capacity

(D) Rotation factor

25. In terms of theoretical stress concentration factor (K_t) and fatigue stress concentration factor (K_f), the notch sensitivity 'q' is expressed as

(A) $\frac{(K_f - 1)}{(K_t - 1)}$ (B) $\frac{(K_f - 1)}{(K_t + 1)}$

(C) $\frac{(K_t - 1)}{(K_f - 1)}$ (D) $\frac{(K_f + 1)}{(K_t + 1)}$

26. Forging temperature of medium carbon steel is approximately

(A) 950°C to 1300°C

(B) 750°C to 1250°C

(C) 800°C to 1100°C

(D) 900°C to 1250°C

27. Cold working of metals is carried out

(A) Below lower critical temperature

(B) Below upper critical temperature

(C) Below recrystallization temperature

(D) Below 15°C

28. In DC arc welding when work is connected to the positive terminal, it is called a

(A) Straight polarity

(B) Reversed polarity

(C) Cross polarity

(D) None of the above

29. The mechanism of material removal in EDM process is

(A) Melting and evaporation

(B) Melting and corrosion

(C) Erosion and cavitation

(D) Cavitation and evaporation

30. Military organization is known as

(A) Line organization

(B) Line and Staff organization

(C) Functional organization

(D) All of the above

Space For Rough Work

MECHANICAL SCIENCES

(Common to AE/MC/IPE/IEM/MSE)

PART – A

(SECTION –II)

(Each question carries two marks) (15 × 2 = 30)

31. If $u = x^2 + y^2$, $x = at^2$, $y = 2at$, then the value of the total derivative $\frac{du}{dt}$ = _____

(A) $4a^2t\,(t + 2)$

(B) $4a^2t^2\,(t + 2)$

(C) $4a^2t\,(t^2 + 2)$

(D) $4at^2\,(t + 2)$

32. If $\frac{dy}{dx} = x + y$, $y\,(0) = 1$, $h = 0.2$, by Runge-Kutta method $K_1 = 0.2$, $K_2 = 0.24$, $K_3 = 0.244$

then the value of K_4 = _____

(A) 0.182

(B) 0.287

(C) 0.280

(D) 0.2888

33. Closed packed hexagonal space lattice is found in

(A) zinc, magnesium, cobalt, cadmium, antimony and bismuth

(B) gamma-iron, aluminium, copper, lead, silver and nickel

(C) alpha-iron, tungsten, chromium and molybdenum

(D) none of the above

34. Dye penetrent method is generally used to locate

(A) core defects

(B) surface defects

(C) superficial defects

(D) temporary defects

35. If point A is in equilibrium under the action of the applied forces, the values of tensions T_{AB} and T_{AC} are respectively

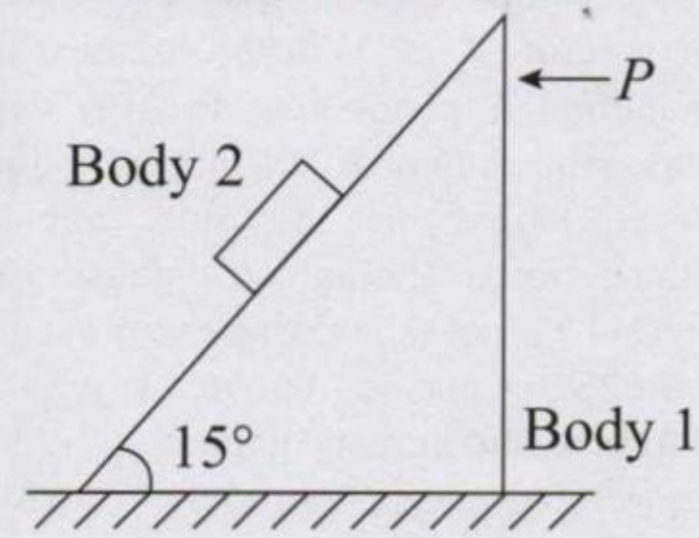
(A) 520 N and 300 N

(B) 300 N and 520 N

(C) 450 N and 150 N

(D) 150 N and 450 N

36. Bodies 1 and 2 shown in the figure have equal mass m. All surfaces are smooth. The value of force P required to prevent sliding of body 2 on body 1 is

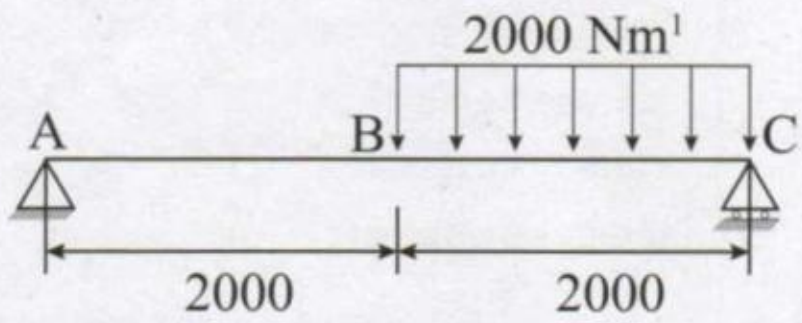


(A) $P = 2$ mg (B) $P = \sqrt{2}$ mg

(C) $P = 2\sqrt{2}$ mg (D) $P =$ mg

Space For Rough Work

37. A massless beam has a loading pattern as shown in the figure. The beam is of rectangular cross-section with a width of 30 mm and height of 100 mm. The maximum magnitude of bending stress (in MPa) is given by



(A) 60.0 (B) 67.5

(C) 200.0 (D) 225.0

38. For an engine operating on air standard Otto cycle, the clearance volume is 10% of the swept volume. The specific heat ratio of air is 1.4. The air standard cycle efficiency is

(A) 38.3 % (B) 39.8 %

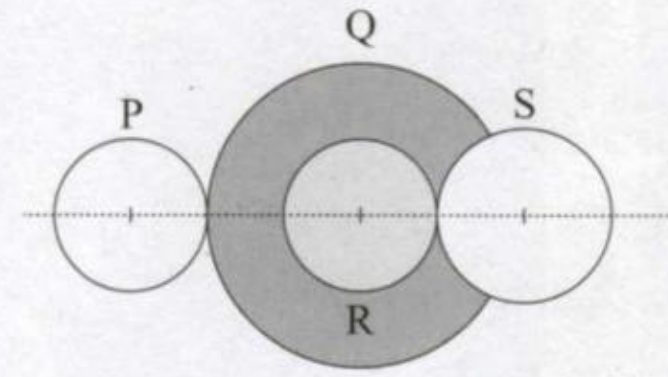
(C) 60.2 % (D) 61.7%

39. Temperature of nitrogen in a vessel of volume 2 m^3 is 288 K. A U-tube manometer connected to the vessel shows a reading of 700 mm of mercury (level higher in the end open to atmosphere). The universal gas constant is 8314 J/kmol-K, atmospheric pressure is 1.01325 bar, acceleration due to gravity is 9.81 m/s^2 and density of mercury is 13600 kg/m^3. The mass of nitrogen (in kg) in the vessel is

(A) 4.56 kg (B) 5.46 kg

(C) 4.34 kg (D) 6.45 kg

40. A compound gear train with gears P, Q, R and S has number of teeth 20, 40, 15 and 20 respectively. Gears Q and R are mounted on the same shaft as shown in the figure given below. The diameter of the gear Q is twice that of the gear R. If the module of the gear R is 2 mm, the center distance in mm between gears P and S is



(A) 40 (B) 80

(C) 120 (D) 160

41. Match the approaches given below to perform stated kinematics/dynamics analysis of machine.

Analysis:

P. Continuous relative rotation
Q. Velocity and acceleration
R. Mobility
S. Dynamic-static analysis

Approach:

1. D' Alembert's principle
2. Grubler's criterion
3. Grashof's law
4. Kennedy's theorem

(A) P-1, Q-2, R-3, S-4

(B) P-3, Q-4, R-2, S-1

(C) P-2, Q-3, R-4, S-1

(D) P-4, Q-2, R-1, S-3

Space For Rough Work

42. Match the type of gears with their most appropriate description:

Type of gear:

P. Helical

Q. Spiral Bevel

R. Hypoid

S. Rack and Pinion

Description:

1. Axes non-parallel and non-intersecting
2. Axes parallel and teeth are inclined to the axis.
3. Axes parallel and teeth are parallel to the axis.
4. Axes are perpendicular and intersecting, and teeth are inclined to the axis.
5. Axes are perpendicular and used for large speed reduction.
6. Axes parallel and one of the gears has infinite radius.

(A) P-2, Q-4, R-1, S-6

(B) P-1, Q-4, R-5, S-6

(C) P-2, Q-6, R-4, S-2

(D) P-6,Q-3, R-1, S-5

43. The demand for an item annually is 10,000 units. The ordering cost is Rs. 200 and the inventory carrying cost is 20%of the cost price. The unit price of the commodity is Rs. 100. If there is a penalty cost of Rs. 150 for the shortage, then the EOQ is

(A) 523 (B) 476

(C) 412 (D) 365

44. The demand for a product during the years 1995, 1996, 1997, 1998 and 1999 are 12, 13, 11, 10, 12 units respectively. The demand for the year 2000 is

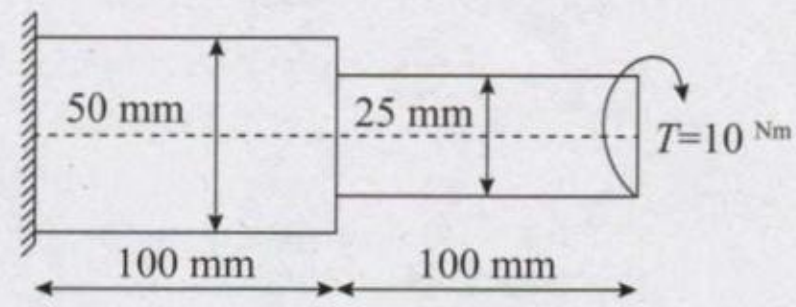
(A) 14

(B) 13.8

(C) 12.6

(D) 10.7

45. A stepped steel shaft shown below is subjected to 10 Nm torque. If the modulus of rigidity is 80 GPa, the strain energy in the shaft in N-mm is



(A) 4.12

(B) 3.46

(C) 1.73

(D) 0.86

Space For Rough Work

F-2

AE : AUTOMOBILE ENGINEERING
PART – B
SECTION –I
(Each question carries one mark) **(20 × 1 = 20)**

46. If the air-fuel mixture in a spark ignition engine is too rich, then air-fuel ratio is about

(A) 17:1 (B) 15:1

(C) 13:1 (D) 10:1

47. The diagram which shows the correct crank positions corresponding to the opening and closing of the valves, is known as

(A) Indicator diagram

(B) Axial force diagram

(C) Valve timing diagram

(D) None of these

48. The main task of a battery in automobiles is to

(A) supply electricity to the alternator

(B) act as a reservoir or stabilizer of electricity.

(C) supply electricity to the vehicle's electrical system at all times while the engine is running

(D) supply a large amount of power to turn the starter motor when the engine is being started.

49. What gets deposited on the plates of a discharged lead-acid battery?

(A) PbO_2 (B) Pb_2O_4

(C) Pb (D) $PbSO_4$

50. The starting system includes

(A) a battery, a starter and an ignition switch

(B) a battery, a distributor and an ignition switch

(C) a battery, a starter and a distributor

(D) a distributor, a starter and an ignition switch

51. The damper fluid leakage typically occur from

(A) upper damper mounting

(B) bottom of damper

(C) clearance between inner and outer tubes of damper

(D) coil spring mounting

52. In a single dry plate clutch, torsional vibrations are absorbed by

(A) coil springs known as torsional springs

(B) cushion springs

(C) central hub

(D) clutch pedal

53. Which of the following vibrations are classified according to magnitude of actuating force?

(A) Torsional vibrations

(B) Deterministic vibrations

(C) Transverse vibrations

(D) All of the above

Space For Rough Work

54. Which of the following relations is true for viscous damping?
(A) Force α relative displacement
(B) Force α relative velocity
(C) Force α (1 / relative velocity)
(D) None of the above

55. Eddy current damping is an example of _____
(A) Coulomb damping
(B) Hysteresis damping
(C) Viscous damping
(D) Dry friction damping

56. In the automobile, the power train carries the engine power from the engine to the rear wheels. The power train includes the clutch propeller shaft, differential and
(A) Front axis (B) Steering gear
(C) Gear box (D) Chassis

57. The axes of the two shafts are intersecting and are at 30° to each other. These two shafts are connected by Hook's joint. At which position of the drives shaft velocity ratio will be minimum?
(A) 90°, 270° (B) 0°, 180°
(C) 180°, 270° (D) 90°, 180°

58. Which one of the following statements is TRUE?
(A) 'G0' gauge controls the upper limit of hole
(B) 'N0G0' gauge controls the lower limit of shaft.
(C) 'G0' gauge controls the lower limit of hole.
(D) 'N0G0' gauge controls the lower limit of hole.

59. Error of measurement is equal to
(A) True value – Measured value
(B) Precision – True value
(C) Measured value – Precision
(D) None of the above.

60. The amount by which actual size of a shaft is less than the actual size of mating hole in an assembly?
(A) clearance (B) Interference
(C) Allowance (D) None

61. Bourdon tube is used for the measurement of gauge pressure of
(A) Gas (B) Liquid
(C) Solid (D) Both (A) and (B)

62. Which is the direct surface roughness measuring instrument?
(A) Micro interferometer
(B) Surface dynamometer
(C) Profilometer
(D) Surface gauge

63. CNC drilling machine is considered to be
(A) Point-to-Point control machine
(B) Straight line control machine
(C) Linear path control machine
(D) None

64. In Part Programming, interpolation is used for obtaining _____ trajectory.
(A) Helicoidal (B) Zig-Zag
(C) Pentagonal (D) Triangular

65. DNC refers to
(A) Distributed Numerical control
(B) Direct Numerical control
(C) Design Numerical control
(D) None

Space For Rough Work

(SECTION – II)
(Each question carries two marks) (10 × 2 = 20)

66. What is the value of the rate of flow of fuel if the coefficient discharge of fuel is 0.75? Area of the jet is 0.885 mm^2, density of the fuel is 780 kg/m^3 and pressure differential causing fuel flow is 15,000 Pa.
    (A) 3.21 g/s (B) 4.21 g/s
    (C) 5.21 g/s (D) 6.21 g/s

67. What is the cold rate of a battery?
    (A) Lasting power of a battery on a small load
    (B) Rate of current for 20 minutes with a minimum cell voltage of 1.5 V
    (C) The current which the battery can supply continuously for 30 seconds with minimum cell voltage of 1.2 V.
    (D) Time for which the battery can supply 25 A at 80°F with minimum cell voltage of 1.75 V.

68. Determine logarithmic decrement, if the amplitude of a vibrating body reduces to 1/6th in two cycles.
    (A) 0.223 (B) 0.8958
    (C) 0.3890 (D) None of the above

69. Calculate coefficient of viscous damper, if the system is critically damped. Consider the following data:
    Mass of spring mass damper system = 350 Kg.
    Static deflection = 2×10^{-3} m.
    Natural frequency of the system = 60 rad/sec.
    (A) 100.5×10^3 N-s/m
    (B) 80×10^3 N-s/m
    (C) 42×10^3 N-s/m
    (D) None of the above.

70. Calculate logarithmic decrement if damping factor is 0.33.
    (A) 1.36 (B) 3.23
    (C) 5.16 (D) 2.19

71. A piston made of gray cast iron has piston head thickness of 20 mm. What will be the thickness of piston barrel under piston rings if it has allowable tensile stress of 30 N/mm^2? (Bore diameter = 50 mm and $P_{max} = 15 N/mm^2$)
    (A) 10 mm (B) 20 mm
    (C) 30 mm (D) 40 mm

72. To obtain dimension of 61.18 mm using slip gauges, the most appropriate combination is
    (A) 1.18 + 50.00 + 10.00
    (B) 0.08 + 1.10 + 60.00
    (C) 1.08 + 0.10 + 50.00 + 10.00
    (D) 1.08 + 1.10 + 50.00 + 9.00

73. In a CAD package, the mirror image of a 2D Point P(5, 10) is to be obtained about a line which passes through the origin and makes an angle of 45° counter clockwise with the X-axis. The coordinates of transformed point will be
    (A) (2.5, 5) (B) (5, 10.5)
    (C) (10, 5) (D) (10, – 5)

74. The number of lines required to represent a cube in a wire frame model is
    (A) 8 (B) 6
    (C) 12 (D) 16

75. Control resolution of an 8-bit robot joint with a rotational joint is
    (A) 1.2 (B) 1.406
    (C) 1.25 (D) 1.22

Space For Rough Work

MC : MECHANICAL ENGINEERING
PART – B
(SECTION – I)
(Each question carries one mark) (20 × 1 = 20)

46. Steam in the condenser of a thermal power plant is to be condensed at a temperature of 30°C with cooling water which enters the tubes of the condenser at 14°C and exits at 22°C. Overall heat transfer coefficient is 2000W/m²K and the total surface area of the tubes is 50m². Net heat transfer is

(A) 1.4 (B) 1.3

(C) 1.2 (D) 1.154

47. One-dimensional steady state heat conduction takes place through a solid whose cross-sectional area varies linearly in the direction of heat transfer. Assume there is no heat generation in the solid and the thermal conductivity of the material is constant and independent of temperature. The temperature distribution in the solid is

(A) Linear

(B) Logarithmic

(C) Quadratic

(D) Exponential

48. In free convention heat transfer, transition from laminar to turbulent is governed by

(A) Reynolds number

(B) Grashof number

(C) Reynolds number and Grashof number

(D) Grashof number and Prandtl number

49. Absorptivity of a body is equal to its emissivity

(A) for a polished body

(B) under thermal equilibrium condition

(C) at one particular temperature

(D) at shorter wavelength

50. Kaplan turbine is

(A) a high head mixed flow turbine

(B) a low head axial flow turbine

(C) an outward flow reaction turbine

(D) an impulse inward flow turbine

51. Parson's reaction turbine is a _____ reaction turbine.

(A) 40 per cent (B) 50 per cent

(C) 60 per cent (D) 70 per cent

52. _____ management function is regarded as essence of Management.

(A) organising

(B) planning

(C) co-ordinating

(D) staffing

Space For Rough Work

53. Two factor theory is based on which factors?

(A) Hygiene and behaviour

(B) Safety and self-esteem

(C) Physiological and safety

(D) All of the above

54. A stepper motor is _____

(A) Two-phase induction motor

(B) Rotating amplifier

(C) Electromagnetic transducer

(D) Electromechanical device

55. A pressure control process using proportional plus integral control has a time constant of 10 seconds. The best choice of actuator would be _____

(A) Electric motor

(B) Pneumatic diaphragm

(C) Piston and cylinder

(D) Solenoid

56. The concept of a general CAD system was that it should provide

(A) A system for handling use actions

(B) A system for the operation of applications programming

(C) A set of basic system functions and utilities

(D) All of the above

57. Internal State Sensors are used for measuring _____ of the end effector.

(A) Position

(B) Position and Velocity

(C) Velocity and Acceleration

(D) Position, Velocity and Acceleration

58. The walk-through method of programming a robot involves

(A) Moving the location of robot from A to B.

(B) Physically moving the robot through all the motions it is to repeat

(C) Moving the end effector

(D) Walking through the suggested procedure by the robot programmer.

Space For Rough Work

59. Which of the following is the first step in making a correct location choice?

(A) Develop location alternatives

(B) Decide the criteria for evaluating location alternatives

(C) Evaluate the alternatives

(D) Make a decision and select the location

60. Activities related to coordinating, controlling and planning activities of flow of inventory are classified as

(A) Decision management

(B) Throughput management

(C) Inventory management

(D) Manufacturing management

61. An Assignment algorithm was developed by using _____ method.

(A) Hungarian

(B) VOGELS

(C) MODI

(D) Travelling Salesman

62. The critical path is _____

(A) A path that operates from the starting node to the end node

(B) A mixture of all paths

(C) The longest path

(D) The shortest path

63. The L.C. of a metric vernier caliper having 25 divisions on vernier scale, matching with 24 divisions of main scale (1 MSD = 0.5 mm) is _____ mm.

(A) 0.05

(B) 0.01

(C) 0.02

(D) 0.001

64. M and E System in Metrology are related with the measurement of

(A) Gears

(B) Surface Finish

(C) Flatness

(D) Angularity

65. A comparator for its working depends on

(A) Accurately calibrated scale

(B) Comparison with standards such as slip gauges

(C) Micrometer gauge

(D) Optical device

Space For Rough Work

(SECTION – II)
(Each question carries two marks) (10 × 2 = 20)

66. Arrange the following components of temperature measurement system according measurement system:

Hot body, Display system, Thermocouple, Amplifier and Converter

(A) Hot body - Display System - Thermocouple - Amplifier and Converter.

(B) Hot body - Amplifier and Converter - Thermocouple - Display System

(C) Hot Body - Thermocouple - Amplifier and Converter - Display System

(D) None of the above

67. Given an actual demand of 59, a previous forecast of 64 and $\alpha = 0.3$. What would be the forecast for the next period using simple exponential smoothing?

(A) 36.9

(B) 57.5

(C) 60.5

(D) 62.5

68. If the demand in units is 18,000, relevant ordering cost for each year is Rs. 150 and an order quantity is 1,500 units, then the annual ordering cost would be _____

(A) Rs. 200

(B) Rs. 190

(C) Rs. 160

(D) Rs. 180

69. A company has an order policy of 50 units with one week lead time. Currently, there are 25 units in inventory. The demand forecast for booked orders are shown. Identify the first week in which an MPS quantity is used:

Week	1	2	3	4
Forecast	35	30	25	20
Customer orders	45	28	27	30

(A) 3

(B) 2

(C) 4

(D) 1

70. For an LP problem,

Maximize $Z = 3x_1 + 2x_2$

Subject to $-2x_1 + 3x_2 \leq 9$

$x_1 - 5x_2 \geq -20$,

$x_1 x_2 \geq 0$

The above problem has

(A) Unbounded solution

(B) Infeasible solution

(C) Degenerate solution

(D) None of the above

Space For Rough Work

71. The expected time (t_e) of a PERT activity in terms of optimistic time (t_o) pessimistic time (t_p) and most likely time (t_L) is given by:

(A) $\frac{t_e = t_o + 4t_L + t_p}{6}$

(B) $t_e = \frac{t_o + 4t_p + t_L}{6}$

(C) $t_e = \frac{t_o + 4t_L + t_p}{3}$

(D) $t_e = \frac{t_o + 4t_p + t_L}{3}$

72. Following data refers to the activities of a project, where node 1 refers to the start and node 5 refers to the end of the project:

Activity	1-2	2-3	4-3	1-4	2-5	3-5	4-5
Duration (days)	2	1	3	3	3	2	4

The Critical Path (CP) in the network is

(A) 1 – 2 – 3 – 5

(B) 1 – 4 – 3 – 5

(C) 1 – 2 – 3 – 4 – 5

(D) 1 – 4 – 5

73. There are two products P and Q with the following characteristics:

Product	Demand (units)	order cost (Rs/ order)	Holding cost Rs/ unit/year
P	100	50	4
Q	400	50	1

The EOQ of products P and Q are in the ratio of _____

(A) 1:1 (B) 1:2

(C) 1.4 (D) 1:8

74. Six jobs are to be processed on a machine as per data listed in the table:

Job	Processing time (days)
1	4
2	9
3	5
4	10
5	6
6	8

Average flow time (days) for the above jobs sequence using shortest processing time rule is _____

(A) 20.83

(B) 23.16

(C) 125

(D) 139

75. A bush was turned after mounting the same on a mandrel. The mandrel diameter in mm is $40^{+0.00}_{-0.05}$ and bore diameter of the bush is $40^{+0.06}_{-0.00}$. The maximum eccentricity of the bush in mm will be

(A) 0.01

(B) 0.055

(C) 0.1

(D) 0.11

Space For Rough Work

IPE : INDUSTRIAL & PRODUCTION ENGINEERING
PART – B
(SECTION – I)
(Each question carries one mark) **(20 × 1 = 20)**

46. In transition fit
    (A) tolerance zone of hole and shaft overlap
    (B) tolerance zone of hole is completely below the shaft
    (C) tolerance zone of hole is entirely above the shaft
    (D) None of these

47. Which of the following methods is not used for testing straightness?
    (A) Spirit level method
    (B) Auto collimator
    (C) Interference method
    (D) Beam comparator

48. Which of the following parameters is important for specifying surface roughness ?
    (A) spacing of irregularities
    (B) size of irregularities
    (C) height of irregularities
    (D) height, spacing and form of irregularities

49. VAM stands for
    (A) Vogeal's Approximation Method
    (B) Vageal's Approximate Method
    (C) Vogel's Approximate Method
    (D) Vogel's Approximation Method

50. _____ or _____ are used to balance an assignment or transportation problem.
    (A) Destinations, Sources
    (B) Units supplied, Units demanded
    (C) Dummy rows, dummy columns
    (D) None

51. Game models are classified by the
    (A) size of Payoff
    (B) sum of all Payoff
    (C) nature of strategies employed
    (D) all of the above

52. Process capability is calculated using
    (A) (WSL – LSL)/3σ
    (B) (WSL + LSL)/3σ
    (C) (WSL – LSL)/6σ
    (D) (WSL + LSL)/6σ

Space For Rough Work

53. In a double sampling plan, if the number of defects are in between two cut-off numbers C_1 and C_2, then

(A) lot is accepted

(B) lot is rejected

(C) take another sample

(D) none

54. In a process chart, the symbol used for storage is

(A) Circle

(B) Square

(C) Arrow

(D) Triangle

55. The height of chair should be such that the top of work table is _____ the elbow level of the operator.

(A) at same level of

(B) about 30 mm below

(C) about 30 mm above

(D) about 50 mm above

56. During the execution of CNC Part Program block N020 G02 X45.0 Y25.0 R 5.0, the type of tool motion will be

(A) Circular interpolation

(B) Linear interpolation

(C) Geometrical interpolation

(D) Radial interpolation

57. Spherical coordinate robot has

(A) 2-Linear motion and 1 rotary motion

(B) 2-Linear motion and 2 rotary motion

(C) 1-Linear motion and 2 rotary motion

(D) None of the above

58. Minimum size of a bloom in metal working is

(A) 5 cm × 5 cm

(B) 10 cm × 10 cm

(C) 15 cm × 15 cm

(D) 20 cm × 20 cm

Space For Rough Work

59. Which of the dies is used to produce washer (Blanking and Punching simultaneously)

(A) Simple die

(B) Compound die

(C) Combination die

(D) Progressive die

60. A spring back effect in press working is

(A) Elastic recovery of the sheet metal after removal of load

(B) Regaining original shape of the sheet metal

(C) Release of stored energy

(D) Partial recovery of elastic energy

61. Basic objective of Cost Accounting is

(A) Tax compliance

(B) Financial audit

(C) Cost ascertainment

(D) Profit analysis

62. Which of the following statements is true for ultrasonic test?

(A) Equipment used for ultrasonic testing is portable

(B) Complicated defects can be easily found

(C) Waves generated are hazardous

(D) None

63. During radiography test, which region absorbs less radiation and transmits more?

(A) Low Density region

(B) High Density region

(C) Both (A) and (B)

(D) None

64. Which is the last step used in the magnetic particle test method?

(A) Observation and inspection

(B) Magnetization

(C) Demagnetization

(D) None

65. The voltage used in resistance welding is generally kept between

(A) 4-12V

(B) 12-20V

(C) 20-30V

(D) 30-40V

Space For Rough Work

(SECTION – II)

(Each question carries two marks) **(10 × 2 = 20)**

66. Holes of diameter $25^{+0.040}_{+0.020}$ mm are assembled interchangeably with the pins of diameter $25.0^{+0.005}_{-0.008}$ mm. The minimum clearance in the assembly will be

(A) 0.048 mm

(B) 0.015 mm

(C) 0.005 mm

(D) 0.08 mm

67. For a constraint of a linear optimising function, $Z = x_1 + x_2$ given by $x_1 + x_2 \leq 1$, $3x_1 + x_2 \geq 3$ and $x_1, x_2 \geq 0$

(A) There are two feasible regions.

(B) There are infinite feasible regions.

(C) There is no feasible region.

(D) None of the above.

68. For a quality control process, sample ranges are 1.2, 1.5, 1.1, 1.4 and 1.5. The subgroup size is 5. What will be the process standard deviation if $d_2 = 2.326$ and $A_2 = 0.577$?

(A) 0.576 (B) 2.322

(C) 0.511 (D) None

69. 2500 observations of a production operation were recorded and it was found that the activity under study occurred 1200 times. Determine the limits of accuracy and limit of error:

(A) 48% and 4%

(B) 50% and 6%

(C) 60% and 2%

(D) None

70. A work study sample of a manufacturing activity conducted over a 40-hour period shows that a worker with an 85% rating produced 12 parts. The worker's idle time was 10% and allowance factor is 12%. Calculate the Normal and Standard time for this activity.

(A) 2.8 hrs / part

(B) 2.6 hrs / part

(C) 2.9 hrs / part

(D) 3.0 hrs / part

Space For Rough Work

71. Obtain the transformation matrix, if the Z axis is rotated by an angle of 30° in the clockwise direction.

(A) $\begin{bmatrix} 0.866 & 0.5 \\ -0.5 & 0.866 \end{bmatrix}$

(B) $\begin{bmatrix} 0.866 & -0.5 \\ 0.5 & 0.866 \end{bmatrix}$

(C) $\begin{bmatrix} -0.866 & 0.5 \\ -0.5 & 0.866 \end{bmatrix}$

(D) $\begin{bmatrix} 0.866 & -0.5 \\ 0.5 & -0.866 \end{bmatrix}$

72. In a cylindrical robot, the rotation around Z axis is

(A) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & \sin\theta & -\sin\theta \\ 0 & \sin\theta & \cos\theta \end{bmatrix}$

(B) $\begin{bmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{bmatrix}$

(C) $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$

(D) None

73. A device purchased for Rs. 1,000 has no salvage value and it is expected to serve for 5 years. Book value of device at the end of 4th year is _____

(A) Rs. 6666.66

(B) Rs. 66666.66

(C) Rs. 666.66

(D) Rs. 66.66

74. Liquid penetrant testing can be used to detect

(A) Discontinuities 1.6 mm below the surface

(B) Internal discontinuities

(C) Discontinuities open to the surface

(D) All discontinuities

75. During turning a MS with a feed rate of 0.75 mm/rev is used at 50 rpm. If the chipthickness is 1.5 mm, calculate the length of chip removed by considering the dia of MS work has 50 mm.

(A) 3925 mm

(B) 3025 mm

(C) 3995 mm

(D) 3555 mm

Space For Rough Work

IEM : INDUSTRIAL ENGINEERING AND MANAGEMENT

PART – B

(SECTION – I)

(Each question carries one mark) **(20 × 1 = 20)**

46. A Chronocycle graph provides

(A) Speed acceleration retardation and direction of path traced in space

(B) Speed and acceleration of path traced in space

(C) Motion pattern of path traced in space

(D) Relation between speed and acceleration of the body movement of an operator

47. Quantities that can be numerically measured can be plotted on a _____ control chart.

(A) X bar

(B) P-Chart

(C) C-Chart

(D) nP-Chart

48. How are principles of management formed?

(A) By rule of thumb

(B) By observation and experimentation

(C) By experiences of customers

(D) By experiments in Laboratory

49. Directing function of management embraces activities of

(A) issuing orders to subordinates

(B) guiding and teaching subordinates

(C) providing leadership and motivation to subordinates

(D) all of the above

50. Projections and responses to queries are information output characteristics associated with

(A) Decision Support System

(B) Management Information System

(C) Executive Support System

(D) Transaction Processing System

51. In MIS, _____ plays economically sound and logically in development process.

(A) Information

(B) Data

(C) Statements

(D) Data flow

Space For Rough Work

52. The language used in application programs to request data from the DBMS is referred to as the

(A) DML

(B) DDL

(C) VDL

(D) SDL

53. Key to represent the relationship between tables is called

(A) Primary Key

(B) Secondary Key

(C) Foreign Key

(D) None of these

54. The method through an iterative process progressively approaches and ultimately reaches to the maximum or minimum value of objective function is called

(A) Graphical method

(B) Simplex method

(C) Lagrange's method

(D) North West Corner method

55. Corresponding to every linear programming problem, there is another linear programming problem. The given problem and the other related problem are known as

(A) Primal and dual

(B) Dual and primal

(C) Primal and alternative to primal

(D) None of the above

56. For M-origin and n-destintion, to have any basic feasible solution in transportation model, number of non-zero X_{ij} should be

(A) $M - n + 1$

(B) $M + n - 1$

(C) $M - n - 1$

(D) $M + 1 - n$

57. Stores location is

(A) Strategic decision

(B) Routine decision

(C) Aggregate decision

(D) None of the above

Space For Rough Work

58. Which of the following is not inventory related cost?

(A) Material cost

(B) Stockout cost

(C) Holding cost

(D) Ordering cost

59. In a store when percentage of investment is upto 80% and percentage of items is 17%, the degree of control should be

(A) Severe

(B) Loose

(C) Moderate

(D) No control

60. NC contouring is an example of

(A) Continuous path positioning

(B) Point to Point positioning

(C) Absolute positioning

(D) Incremental positioning

61. In a CNC program block,

N002 G02 G91 X40 Z40 ...., G02 and G91 refer to

(A) Circular interpolation counterclockwise and incremental dimension

(B) Circular interpolation counterclockwise and absolute dimension

(C) Circular interpolation clockwise and incremental dimension

(D) Circular interpolation clockwise and absolute dimension

62. The basic geometric building blocks provided in a CAD/CAM package are

(A) Lines

(B) Points

(C) Circles

(D) All of the mentioned

63. The term that is used for geometric modelling like solid modelling, wine frame modelling and drafting is known as

(A) Software package

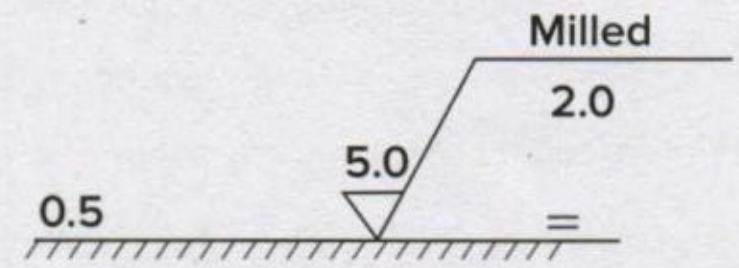
(B) Operating System

(C) Application Software

(D) None of these

64. In a drawing, the machined surface was represented as shown below:

The machining allowance of the surface is



(A) 0.5 mm (B) 5.0 mm

(C) 2.0 mm (D) Not shown

65. According to Taylor's principle, N0G0 gauge checks

(A) only important dimensions at a time

(B) All dimensions at a time

(C) Only one feature at a time

(D) Only related dimension at a time

Space For Rough Work

(SECTION – II)
(Each question carries two marks) (10 × 2 = 20)

66. An operator takes 4.2 minutes to complete an average cycle at the 90% rating. What is the standard work content if the allowance amounts to 15%?

(A) 3.93

(B) 4.35

(C) 4.81

(D) 5.36

67. According to Need Hierarchy theory of Maslow, human needs arise in which one of the following order?

(A) Physiological needs, Social needs, Ego needs, Safety needs, Self actualization needs.

(B) Physiological needs, Safety needs, Social needs, Ego needs, Self actualization needs.

(C) Physiological needs, Safety needs, Ego needs, Social needs, Self actualization needs.

(D) Physiologial needs, Ego needs, Social needs, Safety needs, Self actualization needs.

68. Which of the following steps are the implementation plans involved in MIS?

I. Preparing organization plans

II. Planning of work flow

III. Training of Personnel

IV. Development of Software

V. Acquiring computer hardware

(A) I, II & III only

(B) I, II, III and V only

(C) I, II, IV and V only

(D) All of the above

69. Using Relational Algebra, the query that finds customers who have a balance of over 1000 is

(A) P customer_name [S balance > 1000 (Deposit)]

(B) S customer_name [P balance > 1000 (Deposit)]

(C) P customer_name [S balance > 1000 (Borrow)]

(D) S customer_name [P balance > 1000 (Borrow)]

Space For Rough Work

70. Given the data: annual demand = Rs. 20,000, Ordering Cost = Rs.150 per order,and inventory carrying cost = 24% of the average inventory value. Then EOQ is

(A) 5000

(B) 4500

(C) 500

(D) 5400

71. In an NC machining operation, the tool has to be moved from Point (5, 4) to point (7, 2) along a circular path with centre at (5, 2). Before starting the operation, the tool is at (5, 4). The correct G and N codes for this motioin are

(A) N010 G03 X7.0 Y2.0 I 5.0 J2.0

(B) N010 G02 X7.0 Y2.0 I 5.0 J2.0

(C) N010 G01 X7.0 Y2.0 I 5.0 J2.0

(D) N010 G00 X7.0 Y2.0 I 5.0 J2.0

72. In a CAD package, mirror image of a 2D Point P(.5, 10) is to be obtained about a line which passes through the origin and make an angle of 45° counterclockwise with the x-axis. The coordinates of the transformed point will be

(A) (7.5, 5) (B) (10, 5)

(C) (7.5, – 5) (D) (10, –5)

73. A shaft has a dimension $\Phi\ 35^{-0.009}_{-0.025}$. The respective values of fundamental deviation and tolerance are

(A) – 0.025, ± 0.008

(B) – 0.025, 0.016

(C) – 0.009, ± 0.008

(D) – 0.009, 0.016

74. Industrial Robots are generally designed to carry which of the following coordinate systems?

(A) Cartesian Coordinate System

(B) Polar Coordinate System

(C) Cylindrical Coordinate System

(D) All of the above

75. Which of the following statements is TRUE?

(A) The 'G0' gauge controls the upper limit of a hole.

(B) The 'N0G0' gauge controls the lower limit of a shaft.

(C) The 'G0' gauge controls the lower limit of a hole.

(D) The 'N0G0' gauge controls the lower limit of a hole.

Space For Rough Work

MSE : MANUFACTURING SCIENCE AND ENGINEERING

PART – B

(SECTION – I)

(Each question carries one mark) **(20 × 1 = 20)**

46. An assignment problem is considered as a particular case of a transportation problem because
    (A) The number of rows and columns are equal
    (B) All $X_{ij} = 0$ or 1
    (C) All rim conditions are 1
    (D) All of the above

47. A particular task performance in CPM is called
    (A) Dummy (B) Event
    (C) Activity (D) Contract

48. Rockwell hardness of cemented carbide tool ranges between
    (A) 40 – 50 HRC
    (B) 60 – 70 HRC
    (C) 90 – 100 HRC
    (D) 200 – 300 HRC

49. Ceramic tools are sintered at a temperature of
    (A) 1,000°C (B) 2,000°C
    (C) 1,700°C (D) 3,000°C

50. Tool life is better when the grain size of the metal is
    (A) Large (B) Small
    (C) Blend (D) None

51. Good surface finish and dimensional accuracy is achieved in
    (A) Cold working process
    (B) Hot working process
    (C) Both (A) and (B)
    (D) Warm working process

52. In MIG welding, the metal is transferred in the form of _____
    (A) Molten drops
    (B) Molecules
    (C) Fine spray of metal
    (D) Weld pool

53. The temperature of the plasma torch is of the order of
    (A) 1000°C (B) 5000°C
    (C) 10000°C (D) 3300°C

54. The main reason for occurrence of undercut in welding is due to
    (A) Inclusion of electrode
    (B) High current
    (C) Long arc
    (D) All of the above

55. Commonly used drives in robotics system
    (A) Hydraulic
    (B) Electric
    (C) Pneumatic
    (D) All of the above

56. SCARA robot is used in _____ applications:
    (A) Quality Control
    (B) Assembly
    (C) Defense
    (D) None

Space For Rough Work

57. The suitable example related with automation is

(A) Flexible Manufacturing

(B) Robot

(C) Computer graphics

(D) NC machine

58. In lower bound approach, the production rate (R_p) relation is given by

(A) $R_p = 1 - F/Tp$

(B) $R_p = Tp/1 - F$

(C) $R_p = 1 - Tp/F$

(D) $R_p = F/1 - Tp$

59. The following is not a manual method of line balancing:

(A) Largest candidate rule

(B) COSMOL

(C) Kilbridge and Waster method

(D) COSOL

60. The basic geometric building blocks provided in a CAD/CAM package are

(A) Points

(B) Lines

(C) Circle

(D) All of the above

61. Which of the following are the ways of representing 3D objects?

(A) Wire frame models

(B) Surface models

(C) Solid models

(D) All of the above

62. In NC machine tool, the position feedback system is connected between

(A) Control unit and programmer

(B) Programmer and machine tool

(C) Control unit and machine tool

(D) Programmer and process planning

63. Dead weight gauge is used for the measurement of pressure of _____ bar

(A) 1,000

(B) 2000

(C) 5000

(D) 7000

64. Commonly used material for wire strain gauges are _____

(A) Nickel and copper

(B) Nickel and gold

(C) Silver and Aluminium

(D) Silver and Brass

65. A hole of diameter $\phi\ 25.00^{+0.01}_{-0.00}$ mm is to be inspected by using GO/NOGO gauge. Then the size of the 'GO' plug gauge is _____ mm.

(A) 25.00 mm

(B) 25.01 mm

(C) 24.99 mm

(D) 25.1 mm

Space For Rough Work

(SECTION – II)
(Each question carries two marks) (10 × 2 = 20)

66. The solution to a transportation problem with 'm' rows and 'n' columns is feasible if number of positive allocations are

(A) m + n

(B) m × n

(C) m + n – 1

(D) m + n + 1

67. The order cost per order of an inventory is Rs. 400 with an annual carrying cost of Rs. 10/unit. The EOQ for an annual demand of 2,600 units is

(A) 400

(B) 440

(C) 480

(D) 500

68. In the Taylor's tool life equation $VT^n = C$, where n = 0.5. The tool life has a life of 180 min. at a cutting speed of 18 m/min. The corresponding cutting speed when the tool life is reduced to 45 min. is

(A) 36 m / min

(B) 72 m / min

(C) 18 m / min

(D) 9 m / min

69. During the third stage of tool-wear, rapid deterioration of tool edge takes place because

1. Flank wear is only marginal.
2. Flank wear is large.
3. Temperature of the tool increases gradually.
4. Temperature of the tool increases drastically.

Which of the statements are correct?

(A) 1 and 3

(B) 2 and 4

(C) 1 and 4

(D) 2 and 3

70. A brass billet is to be extruded from its initial diameter of 100 mm to a final diameter of 50 mm. The working temperature of 700°C and the extrusion constant is 250 MPa. The force required for extrusion is

(A) 5.44 MN

(B) 2.72 MN

(C) 1.36 MN

(D) 0.36 MN

71. A DC welding source has a linear voltage current (V-I) characteristics with open circuit voltage of 80V and a short circuit current of 300 A. For maximum arc power, the current in Amps should be set as ____

(A) 100 and 200 (B) 149 and 151

(C) 110 and 112 (D) 120 and 125

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72. The coordinate of a Point P in frame { 1 } are $[3.0\ 2.0\ 1.0]^T$. The position vector P is rotated about z-axis by 45°. Find the position of coordinates i.e. the new position of P.

(A) $[0.707\ 3.555\ 1.0]^T$

(B) $[0.707\ 1.0\ 3.555]^T$

(C) $[1.0\ 3.555\ 0.707]^T$

(D) $[3.555\ 1.0\ 7.707]^T$

73. According to Denavit-Hartenberg's notations, the sequence of axes selection to be followed in order to assign the coordinate systems at the different joints is as follows:

(A) At first X_i, then Y and Z at the end

(B) At first Y_i, then X and Z at the end

(C) At first Z_i, then X and Y at the end

(D) At first Z_i, then Y and X at the end

74. In a CAD package, mirror image of a 2D Point P(5, 10) is to be obtained about a line which passes through the origin and makes an angle of 45° counter clockwise with the X-axis. The coordinates of the transformed Point will be

(A) (7.5, 5)

(B) (10, 5)

(C) (7.5, –5)

(D) (10, –5)

75. A shaft has a diameter of $\phi\ 35.0^{-0.009}_{-0.025}$ The respective values of fundamental deviation and tolerance are

(A) – 0.025 and ± 0.008

(B) – 0.025 and – 0.008

(C) – 0.009 and ± 0.008

(D) – 0.009 and 0.016.

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