SUB: MECHATRONICS ENGINEERING (MC)

Instructions:
1. **Ensure that all pages are printed.**
2. **Use Black ball pen only**
3. **Change in option is not allowed**
4. **There is no negative marking**
5. **Use of non -programmable scientific calculator is allowed**

1. Tensile strength of brittle material is _____ ductile material.

A	Lower than	B	Higher than
C	Equal to	D	None of these

2. Repeated loading and unloading leads to

A	Creep	B	Fatigue
C	Tension	D	Compression

3. Which of the following crystal structures has an atom at the center of unit cell?

A	FCC	B	HCP
C	BCC	D	TCP

4. Resistance to indentation or scratch is called as

A	Toughness	B	Ductility
C	Malleability	D	Hardness

5. Ability of a material to be drawn into thin sheet / plate is called

A	Toughness	B	Ductility
C	Malleability	D	Hardness

6. What is atomic packing factor of simple cubic crystal structure?

A	4	B	3
C	2	D	1

7. Which quenching media does provide maximum hardness on material after quenching?

A	Brine	B	Air
C	Oil	D	Water

8. Which non-destructive test is used to find out hair crack on plastic material?

A	Liquid penetrate test	B	Magnetic particle test
C	Ultrasonic test	D	Eddy current test

9. The following type of safety valve is most suitable for locomotive boiler

A	Dead weight safety valve	B	Spring loaded safety valve
C	Lever loaded safety valve	D	Low water high pressure safety valve

10. A four stroke petrol engine sucks during the suction stroke

A	Only air	B	Only fuel

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C	Mixture of fuel and air	D	Any one of above

11. A 100 c.c. IC engine means that its

A	Swept volume is 100 c.c.	B	Clearance volume is 100 c.c.
C	Clearance + swept volume is 100 c.c.	D	Swept – clearance volume is 100 c.c.

12. Three resistors, each having value of 0.069MΩ, are connected in parallel. The total resistance of the parallel combination is

A	23Ω	B	23KΩ
C	204Ω	D	0.2Mω

13. In an electrical network, junction of branches at a common point is called

A	Loop	B	Mesh
C	Node	D	Joint branch

14. Kirchhoff laws fail in the case of

A	linear networks	B	nonlinear networks
C	dual networks	D	distributed parameter networks

15. Principle of statically induced emf is used in

A	Transformer	B	electric motor
C	Generator	D	Battery

16. Priming is required in

A	Gear pump	B	Screw pump
C	Reciprocating pump	D	Centrifugal pump

17. The usual expansion device used in window air conditioner is

A	Capillary tube	B	Automatic expansion valve
C	Float valve	D	Hand expansion valve

18. The ratio of the ultimate stress to the design stress is known as

A	Elastic limit	B	Strain
C	Factor of safety	D	Bulk modulus

19. The unit of linear acceleration is

A	Kg-m	B	m/s
C	m/s^2	D	rad/s^2

20. The mechanism forms a structure, when the number of degree of freedom (n) of a mechanism is equal to

| A | 0 | B | 1 |
| C | 2 | D | 4 |

21. Dual of a Dual of given problem is

| A | Primal | B | Dual |
| C | Primal dual | D | None of these |

22. Transportation problem is basically a

| A | Maximization model | B | Minimization model |
| C | Transshipment problem | D | Iconic model |

23. VAM in operations research stands for

| A | Value added method | B | Value assessment method |
| C | Vogel Adam method | D | Vogel's approximation method |

24. The Assignment Problem of operations research is solved by

| A | Simplex method | B | Hungarian method |
| C | Graphical method | D | Vector method |

25. Group replacement policy is most suitable for

| A | Trucks | B | Infant machines |
| C | Street light bulbs | D | New cars |

26. The objective of Operations Research is

| A | To find new methods of solving Problems | B | To derive formulas |
| C | To utilize the services of scientists | D | Optimal utilization of existing resources |

27. Pressure is defined as

| A | Area per unit force | B | Force per unit volume |
| C | Volume per unit force | D | Force per unit area |

28. Weight of any substance is defined as

| A | Mass x gravitational acceleration | B | Mass x pressure |
| C | Mass x force | D | Mass x density |

29. Force on piston is calculated as

| A | Piston area x piston volume | B | Pressure x piston area |
| C | Pressure x piston diameter | D | Pressure x temperature in cylinder |

30. Twisting couple in a shaft introduces in it

A   Bending moment   B   Deflection

C   Shear strain   D   Shear stress

31. Mohr's circle can be used to determine following stress on inclined surface

A   Principal stress   B   Normal stress

C   Tangential stress   D   Maximum shear stress

32. Shear force diagram for a cantilever beam carrying a uniformly distributed load over its length is a

A   Triangle   B   Rectangle

C   Hyperbola   D   Parabola

33. A bar when subjected to an axial pull P

A   Decrease in length and width   B   Decrease in length and increase in width
     and increase in thickness   and
                                          thickness

C   Increase in length and decrease D   Increase in length, width and thickness
     in Width and thickness

34. In the elastic region of material deformation stress is

A   Not proportional to strain B   Proportional to strain

C   Unrelated to strain   D   None of these

35. When the tool moves parallel to the lathe axis, the movement is termed as

A   Cross feed   B   Angular feed

C   Rotational feed   D   Longitudinal feed

36. A dynamometer is a device used for the measurement of

A   Chip thickness ratio   B   Forces during metal cutting

C   Wear of the cutting tool   D   Deflection of the cutting tool

37. Long and flat surfaces can be manufactured on

A   shaper   B   Planar

C   Slotter   D   None of these

38. What is the shape of cross section, when a cylinder whose diameter is equal to its length, is cut along its axis?

A   Ellipse   B   Triangle

C   Pentagon   D   Square

39. Multipoint cutting tools are used on _____ machine.

A	Lathe	B	Shaper
C	Milling	D	None of the above

40. In which view, true length of a line is seen, when it is parallel to horizontal plane and inclined to vertical plane.

A	Front view	B	Top view
C	Side view	D	Both A and B

41. Which abrasives are used to make grinding wheel?

A	Graphite powder	B	SiC
C	Granite	D	All of the above

42. Dielectric fluid is used in _____.

A	Electro chemical machining	B	Ultra sonic machining
C	Electro discharge machining	D	Laser machining

43. Which of the following is not a requirement of a good pattern in casting process?

A	It should be light in weight to handle easily	B	It should be smooth to make casting surface smooth
C	It should have low strength to break it	D	none of the above

44. Permeability can be defined as the property of molding sand

A	to allow gases to escape easily from the mold	B	to hold sand grains together
C	to withstand the heat of melt without showing any sign of softening	D	none of the above

45. Which of the following production processes is least flexible?

A	Mass production	B	Batch production
C	Job production	D	None of the above

46. Tempering heat treatment is used for _____.

A	Hardening the component	B	Releasing internal stresses
C	Producing martensite	D	Making brittle component

47. Which quantity can be measured by bourdon tube?

A	Illumination	B	Velocity

| C | Resistance | D | Pressure |

48. The batteries are connected in series to increase _____ .

| A | The voltage capacity | B | The current capacity |
| C | Both A and B | D | None of the above |

49. The frequency of emf generated by a generator depends upon its

| A | Speed | B | Number of poles |
| C | Both A and B | D | None of the above |

50. Carbon brushes are used in electric motors to

| A | prevent sparking during commutation | B | provide a path for flow of current |
| C | to deposit carbon on commutator | D | None of the above |

51. In PLC, for sensing the temperature in any processing line, a temperature sensor can be connected with

| A | Digital input card | B | Digital output card |
| C | Analog input card | D | Analog output card |

52. A 16 bit address bus can generate_____ addresses.

| A | 32737 | B | 65536 |
| C | 25525 | D | None of the above |

53. The left side of any binary number is called

| A | Most significant bit | B | Least significant bit |
| C | Medium significant bit | D | Low significant bit |

54. The software used to drive microprocessor-based systems is called

| A | Assembly language | B | Firmware |
| C | Machine language code | D | None of the above |

55. 2-R robotic manipulator is a _____ robot.

| A | Planar | B | Spatial |
| C | Both A and B | D | None of these |

56. SCARA robot has compliance for _____.

| A | Welding operation | B | Machining operation |
| C | Spray painting operation | D | Assembly operation |

57. Cartesian robot configuration is used for

| A | Heavy load lifting operation | B | Accurate operation |
| C | Both A and B | D | None of these |

58. Which of the following can be used as position sensor?

| A | Synchros | B | Encoder |
| C | Potentiometer | D | All of these |

59. At the center of Fourier transform of digital image _____ frequency components are available.

| A | Low | B | Medium |
| C | High | D | None of these |

60. Thermocouples are used to measure _____.

| A | Pressure | B | Temperature |
| C | Velocity | D | Current |

61. Open-loop control system is

| A | less accurate than closed-loop control system | B | more accurate than closed-loop control system |
| C | equally accurate to closed-loop control system | D | cannot compare with each other |

62. Several machine tools can be controlled by a central computer in

| A | NC (Numerical Control) machine tool | B | CNC (Computer Numerical Control) machine tool |
| C | DNC (Direct Numerical Control) machine tool | D | All of the above |

63. Robot force sensing is done by

| A | Encoders | B | Strain gauge |
| C | Synchros | D | Resolvers |

64. How many gray levels are present in 8 bit system for a digital image?

| A | 256 | B | 128 |
| C | 64 | D | 32 |

65. Edge enhancement in digital image is possible with the help of _____ filters.

| A | Median | B | Average |
| C | Low pass | D | High pass |

66. Which of the following terms refers to the use of compressed gasses to drive (power) the automatic machine?

A	piezo electric	B	Electric
C	hydraulic	D	Pneumatic

67. Radar, infrared and ultrasound sensors measure the _____ physical property.

A	Pressure	B	Inclination
C	Distance	D	Contact

68. According to Joule's law, the internal energy of a perfect gas is the function of absolute ___

A	Temperature	B	Density
C	Volume	D	Pressure

69. How is absolute pressure measured?

A	Gauge pressure x Atmospheric pressure	B	Gauge pressure / Atmospheric pressure
C	Gauge pressure + Atmospheric pressure	D	Gauge pressure - Atmospheric pressure

70. In an isolated system, _____ can be transferred between the system and its surrounding.

A	only energy	B	only mass
C	both energy and mass	D	neither energy nor mass

71. Which gears are used to connect two intersecting shaft axes?

A	Crossed helical gear	B	Worm and worm wheel
C	Bevel gears	D	All of the above

72. Why is an idler gear used in gear trains?

A	To have required direction of rotation	B	To obtain minimum centre distance between driving and driven shaft
C	To increase the speed	D	None of the above

73. Which type of bearings is known as anti friction bearings?

A	Sliding contact bearings	B	Journal bearings
C	Rolling contact bearings	D	All of the above

74. Which among the following is not a type of Non-destructive testing?

A	compression test	B	visual observation
C	ultrasonic testing	D	eddy current testing

75. Which type of mechanism is used in shaper machine?

A	Four-bar chain mechanism	B	Lifting mechanism
C	Quick return mechanism	D	Scaling mechanism

76. Which type of chips form while machining of brittle materials?

A   Discontinuous chips   B   Continuous chips

C   Continuous chips with built-up   D   All of the above
    edge

77. The cutting tool removes the metal from workpiece in the form of

A   Solid blocks   B   Chips

C   Both A and B   D   None of the above

78. In which process the material is removed due to the action of abrasive grains?

A   Ultrasonic Machining (USM)   B   Electro-Chemical Machining (ECM)

C   Laser Beam Machining (LBM)   D   Electrical Discharge Machining (EDM)

79. The product of casting process is called

A   a mould   B   a cavity

C   a pattern   D   a casting

80. A Sine Bar is used to measure

A   Diameter   B   Thickness

C   Width   D   Angle

81. Which function have Laplace Transform even it is not piecewise continuous in the range $t \geq 0$.

A $\dfrac{1}{\sqrt{t}}$ B   All of these

C $\dfrac{1}{\sqrt{t^3}}$ D $\dfrac{1}{\sqrt{t^2}}$

82. Complemtry function of $\left(D^2 + 4\right) y = \tan 200x$.

A $\left(A\cosh 2x + B\sinh 2x\right)$ B $\left(A\cos 2x + B\sin 2x\right)$

C $\left(A\cos 2x - B\sin 2x\right)$ D $\left(A\cosh 2x - B\sinh 2x\right)$

83. In a Poisson distribution if 'n' is the number of trials and 'p' is the probability of success then the mean value is given by.

A   m= n.p   B   m= n.q

C   m= np (1-p)   D   m=p

84. It took 14 sec for a mercury thermometer to rise from -19°C to 100°C when it was taken from a freezer and placed in boiling water. Somewhere along the way the mercury was rising at the rate of _____ C/sec.

A	5	B	8.5
C	10	D	12

85. The value of c in Rolle's theorem for the function f(x)=$\frac{\square(\square+1)}{\square^\square}$ defined on [-1,0] is.

    A   0.5   B   (1+√(5))/2

    C   (1-√(5))/2   D   -0.5

86. The Particular integral of $(D^2 + a^2)y = \sin ax$ is.

    A $\dfrac{x}{2a}\cos ax$ B $-\dfrac{x}{2a}\cos ax$

    C $-\dfrac{ax}{2}\cos ax$ D $\dfrac{ax}{2}\cos ax$

87. Mean of binomial probability distribution is 857.6 and probability is 64% then number of values of binomial distribution.

A	1040	B	1340
C	1240	D	1140

88. $f(Z) = \overline{Z}$ is differnabel.

A	Nowhere	B	Only at Z=0
C	Every Where	D	Only at Z=1

89. The residue of $f(Z) = \cot Z$ at each pole is.

A	0	B	1
C	0.5	D	None

90. Newton-Raphson method is used to find the root of the equation x²-2=0. If iterations are started from -1, the iterations will be

A	converge to -1	B	converge to $\sqrt{2}$
C	converge to $-\sqrt{2}$	D	not converge

91. $L(\sinh at)$ is

    A e^{at} B $\dfrac{s}{s^2 - a^2}$

    C $\dfrac{a}{s^2 - a^2}$ D Exists only if 't' is complex.

92. The poles of $f(Z) = \dfrac{Z^2 + 1}{1 - Z^2}$ is

A	1	B	-1
C	1,-1	D	0

93. The value of $\displaystyle\int_{-\infty}^{\infty} e^{-t}\sin(t)dt = ?$

A	0.50	B	0.25
C	0.17	D	0.12

94. Which of the following differential equation is linear?

    A $\dfrac{dy}{dx} + x^2 y = \cos x$ B $\dfrac{dy}{dx} + y^2 x = x^2$

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C $(x+y)\dfrac{dx}{dy}+y=0$ **D** $\dfrac{dy}{dx}+y(x+y)=x^2$

95. The convergence of which of the followings method is sensitive to starting value?

     A   False position   B   Gauss seidal method

     C   Newton-Raphson method   D   ) All of these

96. If $f(a)=0\,and\,f\,'(a)\neq 0$, then Z=a is called a……

     A   Simple zero   B   Simple curve

     C   Zero of order n   D   None

97. The minimum value of $\sec x$, $x \in [\frac{2\pi}{3}, \pi]$ is

     A   1   B   -1

     C   2   D π

98. $L(\cosh at)$ is.

     A $\dfrac{s}{s^2-a^2}$ B $\dfrac{s+a}{s-a}$

     C   Indeterminate   D $(\sinh(at))^2$

99. If $u(x,y,z)=\sqrt{x^3+y^3+z^3+3xyz}$, then degree of $u=$

     A   3/2   B   2

     C   1   D   ½

100. Using trapezoidal rule, taking 10 equal interval $\int\limits_{0}^{1}\sin x\,dx$ will be

     A   1.902   B   1.941

     C   1.888   D   1.984