

Seat No. _____

SUB: MECHATRONICS ENGINEERING (MC)

Time: 1 Hour 30 minutes

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.	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	Circle	D	Square
2.	Single point cutting tools are commonly used on _____ machine.			
	A	Grinding	B	Shaper
	C	Milling	D	None of the above
3.	In insulators the outermost orbit of their atoms is filled with			
	A	4 electrons	B	8 electrons
	C	1 electron	D	18 electrons
4.	In _____ operation red hot iron rod is hammered on anvil to shape it.			
	A	Forging	B	Extrusion
	C	Wire drawing	D	Spinning
5.	In which view, true length of a line is seen, when it is parallel to horizontal plane and inclined to vertical plane.			
	A	Top view	B	Front view
	C	Side view	D	Both (A) and (B)
6.	Which one of the following expressions does not represent power?			
	A	I^2R	B	V^2/R
	C	VI	D	V^2/I
7.	A conductor of length l and diameter d has resistance of R ohms. If the diameter is reduced to one-third and the length is increased by three times the resistance of the conductor will be _____.			
	A	$3R$	B	$6R$
	C	$9R$	D	$27R$

8.	If dryness fraction is 0.9, the mass of dry steam in 5kg of wet steam is _____ kg.		
	A	5.5	B 5
	C	4.5	D 4
9.	In 4-stroke engine, a working cycle is completed in _____ revolutions of crank shaft.		
	A	1	B 2
	C	3	D 4
10.	Three resistances of equal value, R, are connected such that they form a triangle having terminal A, B and C. The equivalent value of resistances across terminal A and B is equal to _____.		
	A	$R/3$	B $(3/2)R$
	C	$3R$	D $(2/3)R$
11.	Priming is required in _____ pump.		
	A	Gear	B Screw
	C	Reciprocating	D Centrifugal
12.	During refrigeration cycle, heat is rejected by refrigerant in _____.		
	A	Compressor	B Evaporator
	C	Condenser	D Expansion valve
13.	Two resistances, 40 ohm and 20 ohm, are connected in parallel and the combination is connected in series with a 2 ohm resistor. When the whole network is connected across a 100 V supply, the current drawn by the network will be _____.		
	A	10 A	B 1.92 A
	C	20 A	D 2.2 A
14.	The unit of linear acceleration is _____.		
	A	Kg.m	B m/s
	C	m^2/s	D m/s^2
15.	The power factor of a purely resistive circuit is _____.		
	A	1.0	B 0
	C	0.1	D 0.5
16.	A structure has _____ number of degree of freedom.		
	A	0	B 1

	C	2	D	4
17.	Minimum number of links required to form a mechanism are			
	A	2	B	3
	C	4	D	6
18.	The product of voltage and current in an ac circuit is called _____.			
	A	Active power	B	Apparent power
	C	Average power	D	Reactive power
19.	Which non-destructive test is performed to find out hair-crack on surface of plastic material?			
	A	Liquid penetrate test	B	Magnetic particle test
	C	Ultrasonic test	D	Eddy current test
20.	Tempering heat treatment is used for _____.			
	A	Hardening the component	B	Releasing internal stresses
	C	Producing martensite	D	Making brittle component
21.	Which of the following material is used to make single point cutting tool?			
	A	HSS	B	Ceramic
	C	CBN	D	All of the above
22.	Electrolytic fluid is used in _____.			
	A	Electro chemical machining	B	Ultra sonic machining
	C	Electro discharge machining	D	Laser machining
23.	Linear Variable Differential Transformer is a _____.			
	A	Displacement transducer	B	Temperature sensitive transducer
	C	Pressure transducer	D	vibration measuring transducer
24.	Which of the following is not a pressure measurement transducer?			
	A	Thermocouple	B	Piezoelectric transducer
	C	Strain gauge	D	LVDT
25.	If the temperature of semiconducting material increases, what will happen with its resistance?			
	A	Decreases	B	Increases
	C	Remains same	D	None of theses
26.	Which quantity can be measured by bourdon tube?			

	A	Illumination	B	Velocity
	C	Resistance	D	Pressure
27.	A voltmeter has a uniform scale with 100 divisions, the full scale reading is 100 V and can be read up to 1/10 of a scale deviation with a fair degree of certainty. Its resolution is _____.			
	A	0.1 V	B	0.2 V
	C	0.01 V	D	0.02 V
28.	Which of the following is a semiconductor material?			
	A	Ceramic	B	Silicon
	C	Cadmium	D	Rhodium
29.	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
30.	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
31.	A 16 bit address bus can generate_____ addresses.			
	A	32737	B	65536
	C	25525	D	None of the above
32.	The first bit starting from right hand side of any binary number is called			
	A	Most significant bit	B	Least significant bit
	C	Medium significant bit	D	Low significant bit
33.	MOSFET stands for _____.			
	A	Metal oxide silicon field effect transistor	B	Metal oxide semiconductor field excited transistor
	C	Metal oxide semiconductor field effect transistor	D	Metal oxide silicon field excited transistor
34.	Which of the following does not belong to thyristor family?			
	A	DIAC	B	TRIAC
	C	SCR	D	SCS
35.	Which of the following is not an opto-electronics device?			

	A	Light emitting diode	B	Silicon controlled rectifier
	C	Light crystal display	D	Photovoltaic cell
36.	NOR gate is equivalent to _____.			
	A	Inverters connected to the output of an AND gate	B	an inverter connected to the inputs of a NAND gate
	C	Inverters connected to the inputs of an OR gate	D	an inverter connected to the output of an OR gate
37.	A DC motor is preferred to an AC motor for the application in			
	A	low speed operations	B	high speed operations
	C	fixed speed operations	D	variable speed operations
38.	Which material does produce discontinuous chips while machining?			
	A	Aluminum	B	Steel
	C	Cast iron	D	All of the above
39.	Which of the following welding process does use non-consumable electrodes?			
	A	TIG	B	MIG
	C	Manual Arc	D	SAW
40.	In a four stroke IC engine the ratio of speed of crank shaft to that of the cam shaft is			
	A	1:1	B	2:1
	C	1:2	D	1:3
41.	Microprocessors are _____.			
	A	SSI circuits	B	MSI circuits
	C	LSI circuits	D	VLSI circuits
42.	A quick return mechanism is an inversion of a			
	A	4 bar chain	B	5 bar chain
	C	Double slider crank chain	D	Single slider crank chain
43.	A body can be in equilibrium under the action of			
	A	Two unequal and opposite forces	B	Two equal and opposite forces
	C	Two equal and parallel forces	D	Both (A) and (B)
44.	The resultant of two forces (each with a magnitude of $P/2$) acting at a right angle is			
	A	$P/2$	B	$P/(2)^{1/2}$

	C	$P(2)^{1/2}$	D	$(P/2) + 1$
45.	If a string is wrapped around a pillar of radius 'r' for ten turns, the length of the string is			
	A	πr	B	$5 \pi r$
	C	$10 \pi r$	D	$20 \pi r$
46.	A cantilever beam is a beam whose			
	A	One end is fixed and other end is free	B	Both ends are simply supported
	C	Both ends are fixed	D	Both ends are free
47.	Which of the following is not a communication medium?			
	A	Free space	B	Vacuum
	C	Twisted cables	D	Fibre-optic cables
48.	To convert a continuous image data into digital image data, which of the following is required?			
	A	Sampling	B	Quantization
	C	Both sampling and quantization	D	Neither sampling nor quantization
49.	_____ sensor is used for force and torque measurement.			
	A	Strain gauge	B	Synchros
	C	Resolvers	D	Encoders
50.	Which of the following is used for touch sensing application?			
	A	Wire wound potentiometer	B	Synchros
	C	Encoders	D	Limit switch
51.	Motors that can turn their shaft to a specific position are called _____.			
	A	RC motor	B	Service motor
	C	Spare motor	D	Servo motor
52.	_____ pass filter prevents _____ frequencies to pass.			
	A	High, High	B	Low, Medium
	C	High, Low	D	None of the above

53.	At the center of Fourier transform _____ frequency component is available.		
	A	High	B Medium
	C	Low	D zero
54.	Which of the following is a derived unit?		
	A	Mass	B Length
	C	Time	D Velocity
55.	Resistance to indentation or scratch is called as		
	A	Toughness	B Ductility
	C	Malleability	D Hardness
56.	The best conductor of electricity is _____.		
	A	Carbon	B Silicon
	C	Copper	D Silver
57.	Izod impact test is used to find out _____.		
	A	Yield strength	B Tensile strength
	C	Hardness	D Toughness
58.	Which of the following resistors are colour coded?		
	A	Wire wound	B Carbon composition resistors
	C	Variable resistors	D Thermistors
59.	Ohm's law represents the relation between how many terms.		
	A	Two	B Three
	C	Four	D Five
60.	Compressor capacity is having the unit		
	A	mm ³ /kg	B m ³ /min
	C	kg/m ³	D none of the above
61.	The vertical downward feed mechanism in drilling machine uses		
	A	Rack and pinion	B Rotary table
	C	Helical gears	D Bevel gears
62.	Thermal stress arises in a body because of existence of		
	A	Latent heat	B Total heat

	C	Temperature gradient	D	Specific heat
63.	Select the filter which is used most frequently to remove impulse noise from the digital image.			
	A	Gaussian low pass filter	B	Median filter
	C	Butter worth high pass filter	D	Gradient filter
64.	Crater wear can be seen on			
	A	Rake face of tool	B	Flank face of tool
	C	Both (A) and (B)	D	None of the above
65.	A mandrel is used to hold			
	A	Workpiece with hole	B	Heavy workpiece
	C	Flat workpiece	D	Irregular shape workpiece
66.	Two images having pixel gray value 0101 0100 and 0000 0101 at the same location, are operated against AND operator. What would be the resultant pixel gray value at that location in the enhanced image?			
	A	1010 0100	B	1111 1011
	C	0000 0100	D	0101 0101
67.	Laplacian filter is used for _____ digital image.			
	A	Sharpening	B	Blurring
	C	Smoothing	D	Averaging
68.	Find out the filter from the given options that produces a different effect from the other filters on digital image.			
	A	Low pass filter	B	High pass filter
	C	Smoothing filter	D	Averaging filter
69.	The least count of a metric vernier caliper having 25 divisions on vernier scale matching with 24 divisions of main scale (1 main scale division = 0.5mm) is			
	A	0.002 mm	B	0.01 mm
	C	0.2 mm	D	0.02 mm
70.	Bevel protractor is used for			
	A	Linear measurement	B	Height measurement
	C	Flatness measurement	D	Angular measurement
71.	Gear tooth vernier is used to measure			
	A	Circular pitch	B	Tooth height
	C	Addendum	D	Pitch line thickness of tooth

72.	Which of the following drive system is used by a robot for precise location?			
	A	Electric system	B	Hydraulic system
	C	Pneumatic system	D	None of these
73.	Which one of the following terms refers to the up - down motion of a robot wrist?			
	A	Yaw	B	Pitch
	C	Lateral	D	Roll
74.	Item B requires four numbers of item C. Product P requires two numbers of items B and five numbers of item C. If five number of product P is to be manufactured, the number of item C required will be			
	A	65	B	55
	C	45	D	35
75.	Trepanning is an operation of			
	A	sizing and finishing a small diameter hole	B	producing a hole by removing metal along the circumference of a hollow cutting tool
	C	smoothing and squaring the surface around a hole	D	making a cone-shaped enlargement of the end of a hole
76.	Which of the following terms refers to the use of compressed gasses to drive the given robotic system?			
	A	Electric	B	Hydraulic
	C	Piezo electric	D	Pneumatic
77.	The operation of making a cup shaped component from sheet metal is called as			
	A	Drawing operation	B	Punching operation
	C	Casting operation	D	Milling operation
78.	The process of pouring liquid metal into a mould cavity and allowing it to solidify to produce a metallic component is called as			
	A	Forging process	B	Casting process
	C	Drawing process	D	Spinning process
79.	What kind of digital image is produced by thresholding transfer function?			
	A	Binary image	B	Gray scale image
	C	Colour image	D	Index image
80.	In engineering terminology FMS stands for			
	A	Flexible measuring system	B	Flexible manufacturing system

	C	Fixed measuring system	D	Fixed manufacturing system
81.	<p>The rank of a matrix $A = \begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$ is _____</p>			
	A	0	B	1
	C	2	D	3
82.	<p>The matrix $\begin{bmatrix} x & 2 \\ 1 & x-1 \end{bmatrix}$ is singular for $x =$ _____</p>			
	A	-1, 2	B	-1,-2
	C	1,2	D	1,-2
83.	<p>The system of linear equations given below _____.</p> $5x + 3y + 7z = 4$ $3x + 26y + 2z = 9$ $7x + 2y + 10z = 5$			
	A	is inconsistent	B	has unique solution
	C	has infinitely many solutions	D	None of above
84.	<p>$\lim_{x \rightarrow 0} x \log x =$ _____</p>			
	A	0	B	1
	C	-1	D	None of these
85.	<p>Find out the maxima of the function $3x^2 - y^2 + x^3$.</p>			
	A	(0, 0)	B	(-2, 0)
	C	(0,-2)	D	No maxima available
86.	<p>Find out gradient of $f = 3x^2y - y^3z^2$ at $(1, -2, 1)$.</p>			
	A	$(-12, 9, 16)$	B	$(-12, -9, 16)$
	C	$(-12, -9, -16)$	D	None of these
87.	<p>A vector field \vec{F} is said to be solenoidal if _____</p>			
	A	$\text{grad } \vec{F} = 0$	B	$\text{div } \vec{F} = 0$
	C	$\text{div } \vec{F} \neq 0$	D	$\text{curl } \vec{F} = 0$

88.	The general solution of the differential equation $y'' - 3y' + 2y = 0$ is ____.			
	A	$y = c_1 e^x + c_2 e^{2x}$	B	$y = c_1 e^x + c_2 e^{-2x}$
	C	$y = c_1 e^{-x} + c_2 e^{-2x}$	D	$y = c_1 e^x + c_2 x e^{2x}$
89.	Laplace transform of $t \sin 2t$ is			
	A	$\frac{4s}{s^2 + 4}$	B	$\frac{4s}{(s^2 + 4)^2}$
	C	$\frac{s}{s^2 + 4}$	D	$\frac{s}{(s^2 + 4)^2}$
90.	$L^{-1}\{1\} = ______$			
	A	t	B	1
	C	$\delta(t)$	D	$u(t)$
91.	In a bag, there are 8 orange, 6 blue and 7 White balls. If a ball is picked up randomly what is the probability that it is white?			
	A	1/7	B	1/3
	C	1/21	D	8/21
92.	False position method is used to ____.			
	A	evaluate numerical integral	B	evaluate numerical differentiation
	C	solve differential equation	D	to solve algebraic equation
93.	Which of the following is true for $f(z) = z^2 + 2z$?			
	A	Continuous and differentiable	B	Continuous but not differentiable
	C	Differentiable but not continuous	D	Neither differentiable nor continuous
94.	Use Newton Raphson method to find the real root near 2 of the equation $x^4 - 11x + 8 = 0$ correct up to 4 decimal places.			
	A	1.7891	B	1.8918
	C	1.6245	D	1.9357
95.	The probability of hitting a target by Suresh is 3/5. What is the probability that Suresh will hit the target exactly 2 times in 5 attempts?			
	A	72/3125	B	216/625
	C	144/3125	D	144/625
96.	Evaluate $\oint_C \frac{e^z}{z^2 + 1} dz$ over the circle $ z = 2$.			
	A	$2\pi i \sin 1$	B	$2\pi i$

	C	$2\pi \sin 1$	D	2π
97.	For the function $\frac{1}{z-z^3}$ which of the following is true?			
	A	$z=0$ is the pole of order 2	B	$z=i$ is the pole of order 2
	C	$z=\infty$ is zero of order 3	D	$z=0$ is the pole of order 3
98.	Which of the following formula is used to find mathematical expectation of random variable X , i.e. $E(X)$			
	A	$\sum f_i x_i$	B	$\sum f_i x_i^2$
	C	$\sum p_i x_i$	D	$\sum p_i x_i^2$
99.	The first approximation of y_1 of the initial value problem $y' = x^2 + y^2$ with $y(0) = 0$ obtained by Picard's method is _____			
	A	x^2	B	$\frac{x^2}{2}$
	C	$\frac{x^3}{3}$	D	None of these
100.	The general solution of the differential equation $x \frac{dy}{dx} + y + 1 = 0$ is _____			
	A	$x(y-1) = 0$	B	$x(y+1) = C$
	C	$x(y-1) = C$	D	None of these
