

PGCET-2023

Seat No. _____

SUB: Biomedical Engineering

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.	Which of the following is an example of Homology and similarity tool?.			
	A	BLAST	B	RasMol
	C	EMBOSS	D	PROSPECT
2.	The identification of drugs through the genomic study is called;			
	A	Genomics	B	Pharmacogenomics
	C	Pharmacogenetics	D	Cheminformatics
3.	The term Bioinformatics was coined by;			
	A	J D Watson	B	Margaret Dayhoff
	C	Pauline Hogeweg	D	Frederic Sanger
4.	The Human Genome Approximately Contains _____ Pairs			
	A	10 billion base pairs	B	1.5 billion base pairs
	C	2 billion base pairs	D	3 billion base pairs
5.	What is the name of the device that allows the surgeon to control the robotic arms of the da Vinci system?			
	A	Patient console	B	Surgeon console
	C	Robotic arm console	D	Operating room console
6.	Which of the following sensor is able to detect objects without physical contact?			
	A	Electron Beam	B	Laser Beam
	C	X Ray	D	Proximity Sensor
7.	78XX series ICs are;			
	A	Series regulated	B	Shunt regulated
	C	Zener regulated	D	None of these
8.	The first process involved in Biomaterial-Tissue interaction.			
	A	Elongation	B	Foreign Body Response
	C	Adhesion	D	Replication
9.	What is the major drawback of biodegradable polymers?			
	A	Strength	B	Slow process-ability
	C	Fast oxidation	D	Brittleness
10.	Tissue transplants usually give rise to a _____ response			
	A	Cold	B	Hot
	C	Immune	D	None of these
11.	This is an example of photo emissive cell			
	A	Photo multiplier	B	Photo diode
	C	LDR	D	Photo transistor


12.	pH value of venous blood is;			
	A	7.30	B	7.35
	C	7.40	D	7.45
13.	The principal ion that is not involved with the phenomena of producing cell potentials;			
	A	Na ⁺	B	K ⁺
	C	Cl ⁻	D	H ⁺
14.	Impedance pneumography is a commonly-used technique to monitor a person's;			
	A	Respiration rate	B	Heart rate
	C	Pulse rate	D	Skin impedance
15.	Electrocardiography was invented by;			
	A	Robert Koch	B	Werner Forssmann
	C	Gertrude B.Elion	D	Willem Einthoven
16.	The basic functional unit of nervous system is;			
	A	Nerves	B	Axon
	C	Neuron	D	dendrite
17.	The delta wave in EEG ranges;			
	A	0.5-4Hz	B	4-8Hz
	C	8-13Hz	D	13-22Hz
18.	How much quantity of oxygen bound with haemoglobin in the normal arterial blood?			
	A	20.3ml %	B	19.4ml %
	C	21.5ml %	D	20.1ml %
19.	The regulation of the composition of blood plasma is done by which of the following organ?			
	A	Skin	B	Heart
	C	Kidney	D	Lung
20.	The instrument used to hold patients head and guide the placement of electrodes;			
	A	Monotaxic	B	Stereotaxic
	C	Stereotonic	D	Monotonic
21.	The principle of operation of LVDT is based on the variation of			
	A	Reluctance	B	Permanence
	C	Mutual Inductance	D	Self-inductance
22.	Silver chloride electrode is used as a reference electrode due to its			
	A	Stable resting potential	B	Stable half cell potential
	C	Stable action potential	D	Large half cell potential
23.	What is the frequency of ultrasound used for imaging fetus?			
	A	3 MHz	B	100 MHz
	C	20 MHz	D	None of these
24.	What is the range of grayscale values of a 16-bit images			
	A	[0, 255]	B	[0, 15]
	C	[1, 16]	D	[0, 65535]
25.	Unit of magnetic field intensity is;			
	A	Joule	B	Faraday
	C	Henry	D	Tesla

26.	While walking, the stance phase does not involve:			
	A	Loading (Foot flat)	B	Midstance
	C	Terminal stance	D	Midswing
27.	The stress strain curve for tendon has the highest slope in			
	A	Initial toe region	B	Linear region
	C	Failure region	D	None of these
28.	What is the Maxwell model of viscoelasticity?			
	A	A model that describes the behavior of a material as a combination of a spring and a dashpot in series	B	A model that describes the behavior of a material as a combination of a spring and a dashpot in parallel
	C	Both A and B	D	None of these
29.	Which of the following statement is true?			
	A	Bone is stronger in tension than compression.	B	Bone is the strongest in shear.
	C	Bone is stronger in compression than in tension.	D	Both options a and b
30.	Which of the following types of bone cells are responsible for formation of bone tissue during the bending of long bones?			
	A	Osteoblasts	B	Osteoclasts
	C	Osteocytes	D	Chondrocytes
31.	The hamstring group of muscles;			
	A	Flexes the knee and extends the hip	B	Extends the knee and flexes the hip
	C	Extends both the knee and the hip	D	Flexes both the knee and the hip
32.	The hip joint is;			
	A	Saddle joint	B	Hinge joint
	C	Ball and socket joint	D	Pivot joint
33.	The human hand has _____ number of carpal bones and _____ number of meta carpal bones:			
	A	5 and 8	B	8 and 5
	C	3 and 8	D	9 and 5
34.	In the sliding filament theory, binding of myosin to actin happens when:			
	A	Inorganic phosphate is removed	B	New ATP binds to myosin head
	C	ATP is hydrolyzed	D	ADP is released
35.	Which of the following is not a sagittal plane movement?			
	A	Dorsi flexion	B	Plantar flexion
	C	Extension	D	Medial Rotation
36.	If the sampling frequency of the signal is 100 Hz, the sample number 30 will occur at time;			
	A	0.1 sec	B	0.2 sec
	C	0.3 sec	D	0.4 sec

37.	An ECG signal can be approximated as			
	A	Multiplication of an impulse train with ECG wave	B	Addition of an impulse train and the ECG wave
	C	An impulse train each occurring at a beat	D	Multiplication of a square pulse train with the ECG wave
38.	What is the RMS value of the signal $x(n) = \{1,2,3,4,5,6,7,8\}$			
	A	1	B	0
	C	5.05	D	4.09
39.	The z-transform of the minimum phase signal has;			
	A	All the zeros outside the unit circle	B	All the zeros inside the unit circle
	C	All the zeros on the unit circle	D	Zeros are inside and outside of the unit circle
40.	In Pan-Tompkins algorithm;			
	A	Differentiator suppresses the QRS wave	B	Differentiator enhances the P and T wave
	C	Squaring operation reduces the amplitude of entire output of differentiator	D	Differentiator enhances the QRS wave
41.	Contraction of atria by SA node impulse produces _____ in an ECG signal.			
	A	P wave	B	PQ segment
	C	QRS wave	D	T wave
42.	Wiener filter is;			
	A	Optimal FIR Filter	B	Optimal IIR Filter
	C	Adaptive FIR Filter	D	Adaptive IIR Filter
43.	A comb filter is used to remove 60 Hz, 180 Hz, 300 Hz from biomedical signal, sampled at 600 Hz. What will be NOT a location of zeros in the transfer function of comb filter?			
	A	$0.809 \pm 0.588j$	B	$-0.309 \pm 0.951j$
	C	$-1 \pm 0j$	D	$0.951 \pm 0.309j$
44.	Which of the following is not a transducer?			
	A	Microphone	B	Piezoelectric crystal
	C	Load Cell	D	Op-Amp
45.	Which physiological disorder can not be detected using EMG?			
	A	Myopathy	B	Neuropathy
	C	Epilepsy	D	None of these
46.	Purkinje fibres are found in;			
	A	Brain	B	Kidney
	C	Heart	D	Stomach
47.	Most cells maintain a resting potential of the order of;			
	A	-60 to -100 mV	B	-20 to -80 mV
	C	-100 to -160 mV	D	-50 to -130 mV
48.	What is the basic functional unit of respiratory system?			
	A	Bronchial tree	B	Bronchi
	C	Blood	D	Alveoli

49.	Let $x = \{0,1,3,2\}$ and $y = \{2,4,1\}$ are the signals. The linear convolution of x and y is;			
	A	$\{1,0,12,5,17,11,2\}$	B	$\{12,17,11,2,0,1,5\}$
	C	$\{17,11,2,1,0,12,5\}$	D	$\{0,2,10,17,11,2\}$
50.	If the initial conditions for a system are inherently zero, It mean physically;			
	A	The system is at rest but stores energy	B	The system is working but does not store energy
	C	The system is at rest or no energy is stored in any of its part	D	The system is working with zero reference input
51.	A control system with step response is $-0.5(1+e^{-2t})$ is cascaded to another control block with impulse response e^{-t} . The transfer function of the cascaded combination will be;			
	A	$0.5/s(s+2)$	B	$1/(s+1)s$
	C	$1/(s+3)$	D	$0.5/(s+1)(s+2)$
52.	A particular control system yielded a steady state error of 0.20 for unit step input. A unit integrator is cascaded to this system and unit ramp input is applied to this modified system. What is the value of steady-state error for this modified system?			
	A	0.15	B	0.25
	C	0.20	D	0.10
53.	The relation between output response and input signal in closed loop system is;			
	A	Exponential	B	Parabolic
	C	Linear	D	Nonlinear
54.	Feedback control system is basically			
	A	Low pass filter	B	High pass filter
	C	Band pass filter	D	Band stop filter
55.	In a stable control system backlash can cause			
	A	Overdamping	B	Underdamping
	C	Low-level oscillations	D	Poor stability and reduced open loop gain
56.	The 8085 Microprocessor has a ____-bit data bus.			
	A	4	B	8
	C	16	D	32
57.	Which flags are not present in the 8085 microprocessor's flag register?			
	A	Carry flag	B	Zero flag
	C	Sign flag	D	Overflow flag
58.	The 8085 microprocessor's JMP instruction is an example of a ____ jump.			
	A	Conditional	B	Unconditional
	C	Relative	D	Interrupt
59.	The instruction RET is used to ____.			
	A	Restart the microprocessor	B	Return from a subroutine
	C	Return from an interrupted service routine	D	Reset the microprocessor
60.	The 8085 microprocessor has a maximum addressable memory of ____.			
	A	64 KB	B	128 KB
	C	256 KB	D	512 KB

61.	A Harvard architecture has _____.			
	A	An on-chip cache	B	Separate program and data memory
	C	Multiple functional units	D	Unified cache memory
62.	In 8051, stack operations are _____			
	A	last in first out	B	first in first out
	C	last in last out	D	none of these
63.	The call instruction stores the return address,			
	A	in the DPTR register	B	in the program counter
	C	in the stack pointer	D	on the stack
64.	A variable temperature can have any value between -48 to +1118; the variable should be declared with data type ____.			
	A	char	B	unsigned char
	C	int	D	unsigned int
65.	The timers in Mode 1 overflow when the register reaches,			
	A	1FFF	B	FF
	C	FFFF	D	None of these
66.	A Single=phase fully controlled thyristor bridge ac dc convertor is operating at a firing angle 30° and overlap angle 20° constant dc output current of 10 A. What will be the fundamental power factor at input ac main?			
	A	0.968	B	0.766
	C	0.586	D	0.163
67.	The TRIAC is similar as;			
	A	Two SCR connected in parallel	B	Two SCR connected in antiparallel
	C	One SCR and one thyristor in parallel	D	Two SCR connected in series
68.	BCD counter is also known as;			
	A	Parallel counter	B	Synchronous counter
	C	Decade counter	D	VLSI counter
69.	Ripple counters are also known as;			
	A	SSI counters	B	Asynchronous counters
	C	Synchronous counters	D	VLSI counters
70.	Which of these pins will allow to activate and deactivate a multiplexer?			
	A	Enable pin	B	Selection pin
	C	Logic pin	D	Preset pin
71.	How many cycles of addition and shifting in a 4 – bit multiplier are required to perform multiplication using the shift method?			
	A	1	B	2
	C	4	D	8
72.	What will be the output from a D flip – flop if the clock is low and D = 0?			
	A	0	B	1
	C	Toggle between 0 and 1	D	No change

73.	To get the output $Y = 1$ from the logic circuit given below, the value of input must be;																		
																			
A	$A = 1, B = 0, C = 0$		B	$A = 0, B = 0, C = 1$															
C	$A = 1, B = 0, C = 1$		D	$A = 0, B = 1, C = 0$															
74.	Identify the logic gate when the truth table for two input logic gate is																		
<table><tr><th>A</th><th>B</th><th>Output</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>					A	B	Output	0	0	1	0	1	1	1	0	1	1	1	0
A	B	Output																	
0	0	1																	
0	1	1																	
1	0	1																	
1	1	0																	
A	NAND gate		B	AND gate															
C	OR gate		D	NOR gate															
75.	A DC power supply has no-load voltage of 30 V, and a full-load voltage of 25 V at full-load current of 1 A. Its output resistance & Load regulation are, respectively;																		
A	$5\ \Omega$ & 20 %		B	$25\ \Omega$ & 20 %															
C	$5\ \Omega$ & 16.7 %		D	$25\ \Omega$ & 16.7 %															
76.	Most of the linear ICs are based on the two-transistor differential amplifier, due to its;																		
A	Input voltage dependent linear transfer characteristic		B	High voltage gain															
C	High input resistance		D	High CMRR															
77.	The bandwidth of an RF tuned amplifier is dependent on																		
A	Q-factor of the tuned output circuit		B	Q-factor of the tuned input circuit															
C	Quiescent operating point		D	All of these															
78.	Generally, the gain of the transistor amplifier reduces at high frequencies, due to the;																		
A	Skin effect		B	Coupling capacitors at the output															
C	Coupling capacitors at the input		D	Internal capacitance of the device															
79.	An amplifier without feedback has a voltage gain of 50, input resistance of $1\ \text{k}\Omega$ & output resistance of $2.5\ \text{k}\Omega$. The input resistance of the current shunt negative feedback amplifier using the this amplifier with a feedback factor of 0.2 will be;																		
A	$\frac{1}{5}\ \text{k}\Omega$		B	$5\ \text{k}\Omega$															
C	$\frac{1}{11}\ \text{k}\Omega$		D	$11\ \text{k}\Omega$															
80.	An npn BJT had $g_m = 38\ \text{mA/V}$, $C_\mu = 10^{-14}\ \text{F}$, $C_\pi = 4 \times 10^{-13}\ \text{F}$ and DC current gain $\beta_0 = 90$. Find f_T & f_β ;																		
A	$f_T = 1.64 \times 10^8\ \text{Hz}$ & $f_\beta = 1.47 \times 10^{10}\ \text{Hz}$		B	$f_T = 1.47 \times 10^{10}\ \text{Hz}$ & $f_\beta = 1.47 \times 10^8\ \text{Hz}$															
C	$f_T = 1.33 \times 10^{12}\ \text{Hz}$ & $f_\beta = 1.47 \times 10^{10}\ \text{Hz}$		D	$f_T = 1.47 \times 10^{10}\ \text{Hz}$ & $f_\beta = 133 \times 10^{12}\ \text{Hz}$															
81.	Which of the following conditions holds true for skew- symmetric matrix?																		
A	$A = A'$		B	$A = -A'$															
C	$A = IA$		D	$A = A $															
82.	The Eigen values of a 4×4 matrix A are given as 2, -3 , 13, and 7. Then the value of $ \det(A) $ is																		
A	25		B	546															
C	19		D	91															

83.	A linear system is called consistent if it has			
	A	infinitely many solutions	B	at least one solution
	C	no solution	D	none of the above
84.	The gradient of a $xi + yj + zk$ is			
	A	3	B	0
	C	1	D	2
85.	The Stoke's theorem uses which of the following operation?			
	A	Laplacian	B	divergence
	C	Gradient	D	Curl
86.	If $u = x^3 + 2xy^2 + y^3$ then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} =$ _____			
	A	0	B	u
	C	$2u$	D	$3u$
87.	$\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 - xy}{x + y} =$ _____			
	A	0	B	-1
	C	1	D	2
88.	If $u = f(x + ay) + g(x - ay)$ then $u_{yy} =$ _____			
	A	u_{xx}	B	au_{xx}
	C	$a^2 u_{xx}$	D	$-u_{xx}$
89.	The number of arbitrary constants in the particular solution of differential equation of second order is _____			
	A	0	B	2
	C	1	D	3
90.	The particular integral of $Dy = \cos x$			
	A	$-\sin x$	B	$\sin x$
	C	0	D	$\cos x$
91.	If Laplace Transform of some function $f(t)$ is $\frac{s}{s^2 - 4}$ then $f(t)$ is			
	A	$\sin(2t)$	B	$\cos(2t)$
	C	$\sinh(2t)$	D	$\cosh(2t)$
92.	The equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ is known as the _____			
	A	One dimensional heat equation	B	Laplace Equation
	C	One dimensional wave equation	D	Poisson Equation
93.	A function $f(z) = xy + iy$ is analytic _____			
	A	Nowhere analytic	B	Analytic only at origin
	C	Analytic every where	D	Analytic except at the origin
94.	If there are ten values each equal to 10, then standard deviation of these values is:			
	A	100	B	20
	C	10	D	0
95.	Poisson Distribution is a _____			
	A	Continuous distribution	B	Discrete distribution
	C	Irregular distribution	D	Not a Probability distribution

96.	Probability of certain event is _____			
	A	0.5	B	0
	C	-1	D	1
97.	$f(z) = \bar{z}$ is analytic			
	A	Only at $z=0$	B	Only at $z=i$
	C	Nowhere	D	Everywhere
98.	The value of the integral $\int_C \frac{z}{z^2-9} dz$, where C is the circle $ z = 2$ is			
	A	$2\pi i$	B	$-\pi i$
	C	$-2\pi i$	D	0
99.	In trapezoidal rule, the area of which shape is calculated			
	A	Square	B	Rectangle
	C	Trapezium	D	Circle
100.	The rate of convergence of the iterative method is _____			
	A	Linear	B	Quadratic
	C	Cubic	D	Not convergent