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ENTRANCE EXAMINATION - ACADEMIC SESSION JANUARY 2025

PhD Program: (BIOENGINEERING)

Time:90 Minutes

Max. Marks: 100

(Select the most appropriate answer)
(There are **no negative** marks for wrong answers)

1	Person A can complete painting a building in 21 days and Person B can complete the job in 28 days. How many days does it take for them to complete the job together?	
	a	7
	b	12
	c	24.5
	d	30
2	Two fair dices (six sides for each) are thrown. What is the probability that the sum of the numbers on two dices is eight?	
	a	5/36
	b	6/36
	c	4/36
	d	9/36
3	The temperature field in a body varies according to the equation, $T(x,y) = x^3 + 2xy$. The direction of fastest variation in temperature at the point (1,0) is given by :	
	a	$8i + 3j$
	b	j
	c	$3i + 2j$
	d	$5i + 1.2 j$
4	A simple pendulum of length 5m, with a bob of mass 1 kg, is in simple harmonic motion. As it passes through its mean position, the bob has a speed of 5 m/s. The acceleration of the bob at its mean position will be	
	a	25 m/s^2
	b	0.2 m/s^2
	c	1 m/s^2
	d	0 m/s^2
5	Which technique helps the Artificial Neural Networks to learn?	
	a	Feed forward
	b	Bias
	c	Back-propagation
	d	Memory
6	A fluid column in a tube of 6cm diameter has density of 13.5 g/cc and a height of 76cm. The pressure at the bottom of the column will be close to ?	
	a	0.1 bar
	b	1 bar

	c	10 bar
	d	indeterminate
7	Which of the following ECG wave corresponds to ventricular relaxation?	
	a	P wave
	b	QRS segment
	c	T Wave
	d	All of these
8	On a unit circle what is the length of an arc which subtends an angle of 1 radian at its centre?	
	a	1
	b	p/2
	c	p
	d	2p
9	Two springs with spring constants of 10 and 15 N/cm are joined serially to form a longer spring. What is the resultant spring constant in N/cm?	
	a	5
	b	6
	c	12.5
	d	25
10	Which of the following is the correct sequence with respect to tensile behavior of materials?	
	a	Elastic Limit, Break Point, Yield Point
	b	Break Point, Elastic Limit, Yield Point
	c	Yield point, Break point, Elastic limit
	d	Elastic limit, Yield point, Break point
11	For the differential equation: dy/dx + 5y = 0, with y(0)=1, the solution will be	
	a	e^{-5x}
	b	e^{5x}
	c	$5\,e^{x}$
	d	$5\,e^{5x}$
12	For a binary source of information, with known probabilities of the random occurrence of the events {0,1}, and p(0) and p(1) are as given, which source has the highest information?	
	a	p(0) = 0.25, p(1) = 0.75
	b	p(0) = 0.75, p(1) = 0.25
	c	p(0) = 0.50, p(1) = 0.50
	d	p(0) = 0.00, p(1) = 1.00
13	A rectangular floor is paved with 70 square tiles. The rectangular floor is being rearranged so that 2 tiles will be removed from each row of tiles and 4 more rows of tiles will be added. After the change in layout, the floor shall have 70 tiles, and it will still be a rectangle. How many rows were there in the floor before the change in layout?	
	a	35
	b	10
	c	7
	d	5
14	If a body explodes into 3 identical pieces and two move in the NorthWest and NorthEast direction with equal velocity V, what is the velocity of the 3rd piece?	
	a	2V, South
	b	2V, West
	c	√2.V, South
	d	√2.V, North

15		If an anticlock-wise spinning top is leaning west, which way is it precessing?
	a	West
	b	North
	c	East
	d	South
16		The ideal Op – Amp has the following characteristics. (Ri - input impedance, A - gain, Ro - output impedance)
	a	$Ri = \infty, A = \infty, Ro = 0$
	b	$Ri = 0, A = \infty, Ro = 0$
	c	$Ri = \infty, A = \infty, Ro = \infty$
	d	$Ri = 0, A = \infty, Ro = \infty$
17		In a full wave rectifier, the current in each diode flows for :
	a	whole cycle of the input signal
	b	half cycle of the input signal
	c	more than half cycle of the input signal
	d	none of these
18		The power dissipated by a transistor approximately equals the collector current times:
	a	base emitter voltage
	b	base supply voltage
	c	collector emitter voltage
	d	0.7V
19		The number FF in hexadecimal system has equivalence in decimal system to
	a	128
	b	256
	c	30
	d	255
20		A system with an input x(t) and output y(t) is described by the relation: $y(t) = t.\,x(t)$. This system is:
	a	linear and time-invariant
	b	linear and time-varying
	c	non-linear & time-invariant
	d	non-linear and time-varying
21		A bulb in a staircase has two switches, one switch being at the ground floor and the other one at the first floor. The bulb can be turned ON and also can be turned OFF by any one of the switches irrespective of the state of the other switch. The logic of switching off the bulb resembles:
	a	an AND gate
	b	an OR gate
	c	a NAND gate
	d	an XOR gate
22		The CMRR of a differential amplifier is 100dB and its gain is 1000. If for an input signal the common mode voltage is 10V and differential voltage is 1mV what is the output voltage?
	a	1V
	b	1.01V
	c	1.1V
	d	2V
23		A transistor can be used in which of the following modes
	a	Active
	b	Cut-off
	c	Saturation

	d	All three
24		Two capacitors of 2 µF and 4 µF capacitance are connected in series across a 30 V dc battery. After the capacitors have been charged, the voltage across them will be
	a	15V each
	b	10V and 20 V
	c	20V and 10V
	d	30V each
25		If a signal of 200Hz frequency is sampled at 300Hz, what will be the frequency of the sampled signal?
	a	100Hz
	b	200Hz
	c	300Hz
	d	400Hz
26		In a 1.5T MRI what is the frequency of radio waves used?
	a	64Hz
	b	64kHz
	c	64MHz
	d	64GHz
27		Which medical imaging modality is best for imaging the brain in terms of both safety and resolution?
	a	MRI
	b	X-ray CT
	c	Ultrasound
	d	All of these
28		Which of the following is a radioisotope based imaging technique?
	a	CT
	b	MRI
	c	PET
	d	Ultrasound
29		A patient has a Cardiac output of 5litres/min and a heart rate of 70 beats per minute. What is the stroke volume of the patient?
	a	50ml
	b	70ml
	c	90ml
	d	100ml
30		Which of the following are used to improve safety of medical equipment
	a	Grounding
	b	Double Insulation
	c	ELCB
	d	All of these
31		Stroke affects which of the following body organ?
	a	heart
	b	brain
	c	liver
	d	lungs
32		What does the grey matter in the brain consist of?
	a	Muscle cells
	b	Collagen
	c	Nerve axons
	d	Neurons

33	Which node is called the pacemaker of the heart?	
	a	AV Node
	b	SA Node
	c	Lymph Node
	d	Nodes of Ranvier
34	The set of coronary arteries supply blood to	
	a	heart
	b	brain
	c	liver
	d	Eyes
35	Alloy steel most widely used in implantable medical devices is	
	a	SS 304
	b	SS 309
	c	SS 316L
	d	SS 409
36	How many cusps does an aortic valve have	
	a	2
	b	3
	c	4
	d	none of these
37	What is the rest potential of a nerve axon with respect to its surroundings?	
	a	7mV
	b	-7mV
	c	70mV
	d	-70mV
38	Which of the following cells aids in colour vision?	
	a	Cones
	b	Rods
	c	Pacinian Corpuscles
	d	Meisner's corpuscles
39	Which tissue attaches muscles to bones?	
	a	Cartilage
	b	Actin filaments
	c	Tendons
	d	Myosin Filaments
40	Which muscle cells are controlled largely by the autonomic nervous system?	
	a	Skeletal Muscles
	b	Cardiac Muscles
	c	Smooth Muscles
	d	none of these
41	A simple pendulam is set into oscillations. The bob of the pendulam comes to rest after some time due to	
	a	friction of air
	b	its mass
	c	tension in the string
	d	gravity
42	In simple harmonic motion the acceleration is proportional to	
	a	displacement
	b	linear velocity
	c	angular velocity
	d	rate of change of angular velocity

43	A stone falls freely from rest and the distance covered by it in the last second of its motion equals the distance covered by it in the first 4 seconds of its motion. The stone then remains in air for a total period of ..(take g=10m/s2)	
	a	6 s
	b	8.5 s
	c	10.5 s
	d	12.5 s
44	Two bodies of masses m and 2m are dropped from the top of a building. When these bodies reach the ground their kinetic energies will be in the ratio	
	a	1: 2
	b	1: √2
	c	√2:1
	d	1:1
45	Which of the following is the disadvantage of a smoothing filter	
	a	Blur inner pixels
	b	Blur edges
	c	Sharp edges
	d	Remove sharp transitions
46	The material that exhibits the same elastic properties in all directions at a point is called	
	a	Homogenous
	b	Orthotropic
	c	Viscoelastic
	d	Isotropic
47	The most elastic material among the below is	
	a	Rubber
	b	Plastic
	c	Brass
	d	Steel
48	Which of the following imaging modalities is NOT based on X-rays	
	a	Radiography
	b	Ultrasound imaging
	c	Mammography
	d	Flouroscopy
49	Recording electrical activity of muscles is via	
	a	EEG
	b	ECG
	c	EMG
	d	EOG
50	Strain gauge can be used to measure	
	a	Temperature
	b	Pressure
	c	Velocity
	d	Current

51	A boolean function of two variables x and y is defined as follows $f(0,0)=f(0,1)=f(1,1)=1$ and $f(1,0)=0$. Assuming complements of x and y are not available, a minimum cost solution for realizing f using only 2 input NOR and 2 input OR gates (each having unit) would have a total cost of	
	a	1 unit
	b	4 units
	c	3 units
	d	2 units
52	Which of the following parameter is used to assess the magnetic ability of a material	
	a	Magnetization
	b	Magnetic flux density
	c	Susceptibility
	d	Magnetic dipole moment
53	Which of the following forces do not cause the rotation.	
	a	Concurrent
	b	Non-concurrent
	c	Parallel
	d	Non-parallel
54	Which of the following statement for the three force system is true?	
	a	The forces are always in equilibrium
	b	The forces are not always in equilibium
	c	The moments are always in equilibrium
	d	None of the above
55	In a stationary fluid, how does the local pressure of the liquid vary	
	a	In the horizontal direction, only
	b	with depth only
	c	Neither with depth nor along the horizontal direction
	d	Both with depth or along the horizontal direction
56	If a liquid enters a pipe of diameter d with a velocity v, what will its velocity at the exit if the diameter reduces to 0.5d?	
	a	0.5v
	b	2v
	c	4v
	d	v
57	Which one of the following statements is true regarding pressure?	
	a	The pressure is a vector quantity
	b	The pressure is a scalar quantity
	c	The pressure is a vector quantity only when the area is infinitesimally small
	d	The pressure is a scalar quantity only when the area is infinitesimally small
58	Which of the following possess maximum frequency	
	a	Gamma ray
	b	UV rays
	c	Microwaves
	d	Radio waves
59	Any logic gate can be realised by the repeated use of	
	a	OR gates
	b	NOT gates
	c	NAND gates

	d	None of the above
60		Parametric test, unlike the non-parametric tests. make certain assumptions about
	a	The population size
	b	The underlying distribution
	c	The sample size
	d	None of the above
61		W20 (Women 20) Inception Meeting on February 27th -28th, 2023, was hosted at ....city.
	a	Trivandrum
	b	Chennai
	c	Aurangabad
	d	Hyderabad
62		'Suposhit Maa Abhiyan', nutritional support program for pregnant mothers and girls, was launched in ....
	a	Kerala
	b	Karnataka
	c	Assam
	d	Rajasthan
63		The Unique Identification Authority of India is a statutory authority established under the provisions of Aadhaar act 2016 by the Govt. of India under............
	a	Ministry of Electronics and Information Technology
	b	Ministry of Defence
	c	Ministry of External Affairs
	d	Ministry of Science & Technology
64		Jan Aushadhi Train seeks to raise awareness about
	a	Create awareness about Jan Aushadhi scheme
	b	Provide affordable medical devices
	c	Conduct medical camps
	d	Provide vaccinations at free of cost
65		'Medium Range Surface-to-Air Missile (MRSAM)' is produced at ....
	a	IOCL
	b	GAIL
	c	SAIL
	d	BDL
66		The capital city of .... is Pyongyang.
	a	South Africa
	b	North Korea
	c	Singapore
	d	Japan
67		'World Braille Day' is observed on
	a	Jan 1
	b	Jan 4
	c	Jan 7
	d	Jan 10
68		National Data & Analytics Platform (NDAP), was launched by
	a	State Bank of India
	b	NITI Aayog
	c	HDFC
	d	NASSCOM

69	Which Institute has won the National Intellectual Property Award 2019 in the category "Top Indian R & D Institution/Organisation for Patents & Commercialization"?	
	a	SCTIMST
	b	IIT Roorkee
	c	IIT Guwahati
	d	Arrow Greentech Ltd.
70	New Space India Limited is the commercial arm of	
	a	SCTIMST
	b	ISRO
	c	DRDO
	d	BHEL
71	The oath to the Judge of a high court is administered by	
	a	Prime Minister
	b	President
	c	Governor
	d	Chief Justice of India
72	NITI Aayog organized the fifth edition of the Women Transforming India (WTI) Awards in March 2022. As part of the Azadi ka Amrit Mahotsav, the WTI Awards were conferred on .... women achievers to celebrate their contribution towards a 'Sashakt Aur Samarth Bharat'.	
	a	25
	b	50
	c	75
	d	100
73	Who has been appointed as coordinator for the G20 summit, which will be hosted by India in 2023	
	a	Ajith Doval
	b	Harsh Vardhan Shringla
	c	S Jaishankar
	d	Amitabh Kant
74	The maximum term of a Panchayat in a state is .... years	
	a	5
	b	4
	c	3
	d	2
75	According to National Commission for Protection of Child Rights (NCPCR) a child is defined as any person in the age group of?	
	a	0-5
	b	0-10
	c	0-15
	d	0-18
76	The Whistle Blowers Protection Act was enacted in the year	
	a	2015
	b	2014
	c	2013
	d	2012
77	The 5G testbed has been developed as a multi-institute collaborative project by eight institutes led by	
	a	IIT Bombay
	b	IIT Delhi

	c	IIT Madras
	d	IIT Kanpur
78	What is the name of the first Indian space mission to observe the Sun?
	a	Aditya-L1
	b	Chandrayaan-1
	c	Mangalyaan
	d	Chandrayaan-2
79	1853 is a landmark in India's Transport because of first ....
	a	Passenger train
	b	Cargo plane
	c	Submarine
	d	None of the above
80	Which section of the Drugs and Cosmetics Act, 1940 defines the standards of quality for drugs?
	a	16
	b	20
	c	21
	d	22
81	Choose the option that is most nearly same in meaning of the word "Ubiquitous"
	a	Unanimous
	b	Omnipresent
	c	Doubt
	d	Anonymous
82	Choose the option that is most nearly same in meaning of the word "Callous"
	a	Kind
	b	Apathy
	c	Sympathetic
	d	Insensitive
83	Choose the option that is most nearly same in meaning of the word "Genesis"
	a	End
	b	Abolishment
	c	Origin
	d	Attack
84	What will be the remainder if 3^7 is divided by 8?
	a	1
	b	2
	c	3
	d	4
85	A quantity x=240 is increased by 50%. What is the resultant value?
	a	120
	b	240
	c	360
	d	480
86	A quantity x=100 is first increased by 20% and then the resultant is decreased by 10%. What is the final value?
	a	108
	b	109
	c	110

	d	111
87	Anoop bought a car for INR 320000 and sold it for INR 240000. What is the loss percentage?	
	a	20
	b	25
	c	30
	d	35
88	Rohan bought 100 glasses for INR 8500. He broke 20 glasses while transporting them. What should be the selling price of each of the remaining glasses in order to have an overall profit of 4%?	
	a	100.5
	b	110.5
	c	120.5
	d	130.5
89	A worker A can finish work in 3 days and B can finish work in 9 days. How long will it take to finish the work if they both worked together?	
	a	9/2 days
	b	9/7 days
	c	9/5 days
	d	9/4 days
90	Pipes A and B can fill a tank in 4 and 8 hours respectively. Pipe C can empty it in 16 hours. If all the three pipes are opened together, then how long will it take to fill the tank?	
	a	4.5 hours
	b	2 hours
	c	6 hours
	d	3.2 hours
91	A man rows upstream 18 km and downstream 30 km taking 3 h each time. What is the velocity of the current?	
	a	2 km/h
	b	3 km/h
	c	4 km/h
	d	5 km/h
92	A car covers first 300 m at a speed of 54 km/h and next 500 m at a speed of 72 km/h. What is the average speed of the car?	
	a	50 km/h
	b	47 km/h
	c	60 km/h
	d	64 km/h
93	How many words can be formed out of the letters of the word "UNITED" taking all the letters at a time considering no letter is to be repeated?	
	a	620
	b	720
	c	820
	d	920
94	How many words can be formed from the letters of the word "APPLE" taking all the letters at a time considering no letter is to be repeated and first and last letter of the words are "P"?	
	a	6
	b	12
	c	24

	d	48
95	A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?	
	a	3/7
	b	4/7
	c	5/7
	d	6/7
96	A card is drawn from a pack of 52 cards. What is the probability of getting a queen of club or a king of heart?	
	a	1/26
	b	2/26
	c	3/26
	d	4/26
97	Fill in the number that completes the following sequence 3, 5, 7, 11, 13, 17, 19, ...	
	a	20
	b	21
	c	22
	d	23
98	Fill in the blank most appropriately. A .... of wolves.	
	a	Bunch
	b	Fleet
	c	Pack
	d	Litter
99	Which of the following words does not have a similar meaning to densely populated?	
	a	Populace
	b	Crowded
	c	Populous
	d	Packed
100	Find the unit digit of $122^{122} \times 133^{133}$	
	a	1
	b	2
	c	3
	d	4

ENTRANCE EXAMINATION - ACADEMIC SESSION JANUARY 2025
Program: **Program: PhD Bioengineering**
Answer Key

Question No.	Correct answer	Question No.	Correct answer	Question No.	Correct answer
1.	b	38.	a	75.	d
2.	a	39.	c	76.	b
3.	c	40.	c	77.	c
4.	d	41.	a	78.	a
5.	c	42.	a	79.	a
6.	b	43.	b	80.	a
7.	c	44.	a	81.	b
8.	a	45.	b	82.	d
9.	b	46.	d	83.	c
10.	d	47.	d	84.	c
11.	a	48.	b	85.	c
12.	c	49.	c	86.	a
13.	b	50.	b	87.	b
14.	c	51.	d	88.	b
15.	d	52.	c	89.	d
16.	a	53.	a	90.	d
17.	b	54.	b	91.	a
18.	c	55.	b	92.	d
19.	d	56.	c	93.	b
20.	b	57.	b	94.	a
21.	d	58.	a	95.	b
22.	c	59.	c	96.	a
23.	d	60.	b	97.	d
24.	c	61.	c	98.	c
25.	a	62.	d	99.	a
26.	c	63.	a	100.	b
27.	a	64.	a		
28.	c	65.	d		
29.	b	66.	b		
30.	d	67.	b		
31.	b	68.	b		
32.	d	69.	a		
33.	b	70.	b		
34.	a	71.	c		
35.	c	72.	c		
36.	b	73.	b		
37.	c	74.	a		

Name and signature of HoD (To be send to the Registrar in a sealed envelope):

Dr. P.R. Umashankar

Associate Dean (PhD Affairs)