

# PGCET-2022

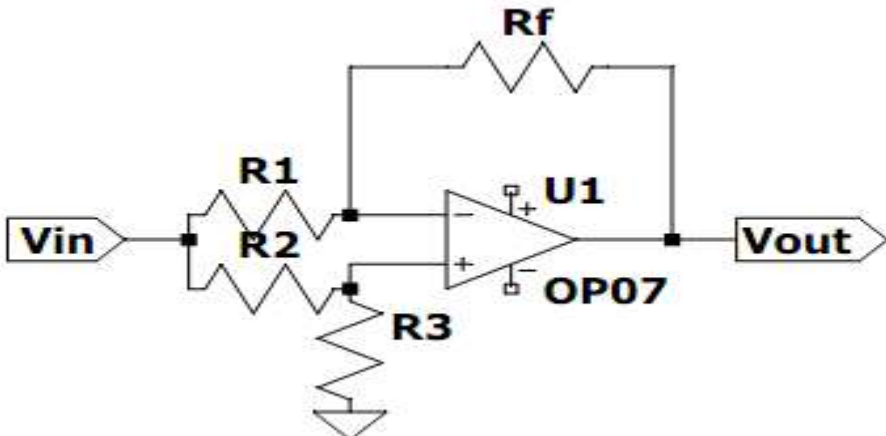
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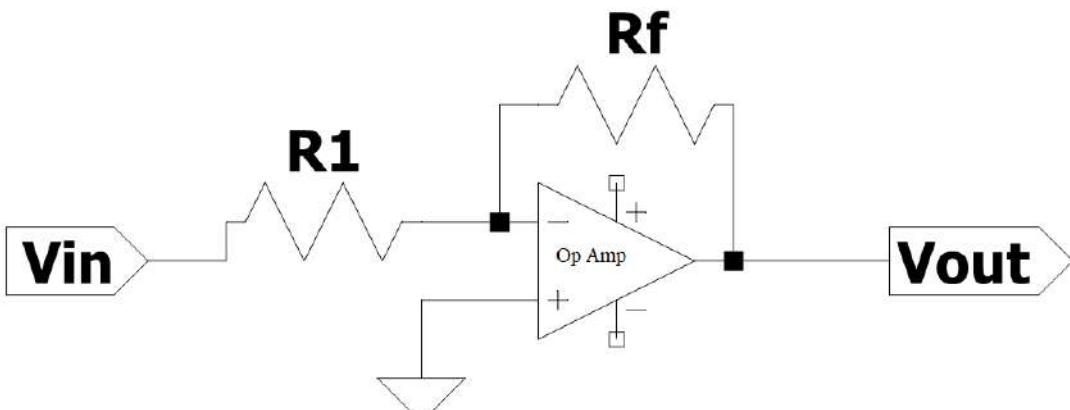
SUB: BIO-MEDICAL ENGINEERING ( BM)

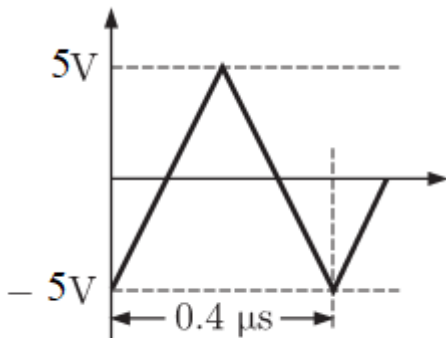
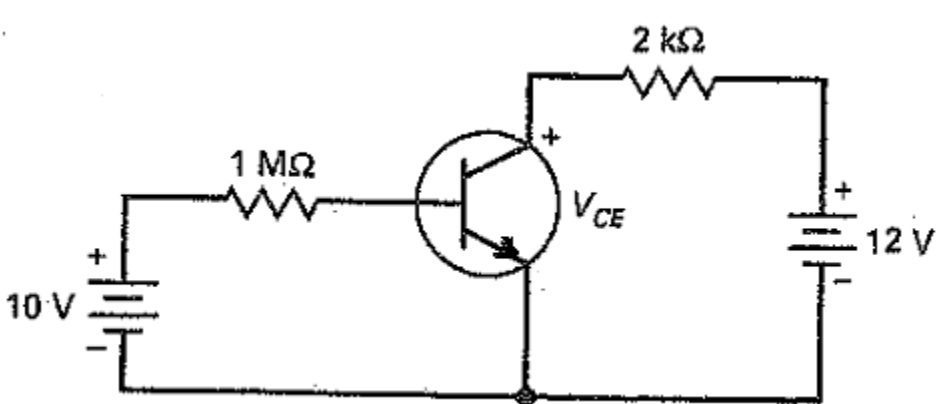
Time:1 Hour 30 minutes

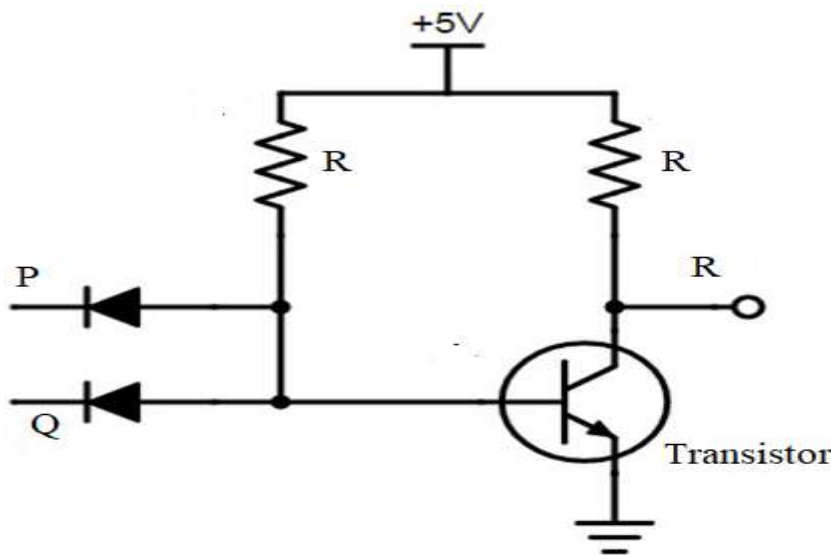
## Instructions:

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

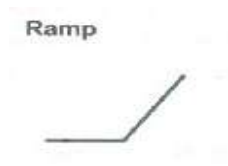
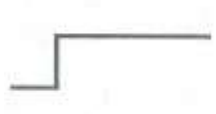
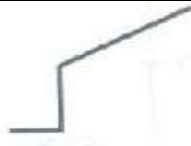


1.	Calculate the Gain of below given amplifier circuit. Value of registers are $R_f= 4K\Omega$ and $R1=R2=R3=2 K\Omega$		
			
A	1	B	$-0.5$
C	$-1$	D	$+0.5$

2.	What is the input resistance of below given amplifier? The resistance value of $R1=10K\Omega$ and $R_f= 50 K\Omega$ .		
			
A	$10 K\Omega$	B	$3 K\Omega$
C	$-3K\Omega$	D	infinite

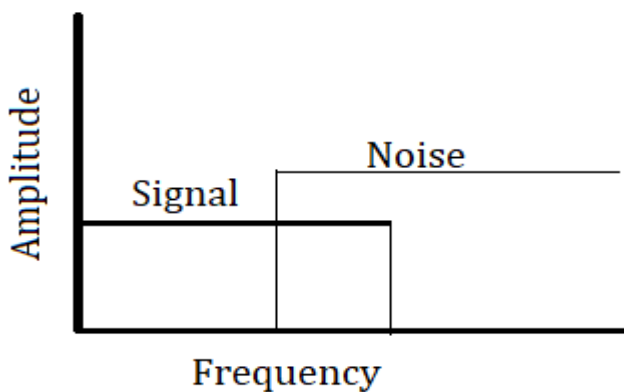
3.	Which statement is true for the Oscillators?			
	A	An oscillator is a circuit that generate s a repetitive waveforms without any external input signal.	B	An oscillator is a type of feedback amplifier in which part of output is fed back to the input via feedback.
	C	The magnitude of the circuit's loop gain must be 1 and total phase shift of the loop gain must be equal to $0^\circ$ or $360^\circ$ .	D	All of the above
4.	<p>The output of an op-amp whose input is a 2.5 MHz square wave is shown in Figure below. The slew rate of the op-amp is</p> 			
	A	25 V/ $\mu$ s	B	2.5 V/ $\mu$ s
	C	12.5 V/ $\mu$ s	D	50 V/ $\mu$ s
5.	<p>The transistor of below given figure has <math>\beta_{dc} = 300</math>. Calculate the collector power dissipation <math>P_D</math>.</p> 			
	A	12.3 mW	B	17.9 mW
	C	4.42 mW	D	2.79 mW

6.	In the below given circuit P and Q is the input and R is the output of circuit. The circuit behave like 			
	A	NAND Gate	B	AND Gate
	C	Exclusive NOR Gate	D	None of Above
7.	For a 4 bit weighted resistor DAC, What is the output voltage when the input is 1110? Full scale output voltage is $-5\text{ V}$ . The logic levels are 1= $+5\text{ V}$ and 0= $0\text{ V}$ .			
	A	$-4.33$	B	$-5\text{ V}$
	C	$-4.67\text{ V}$	D	$-4.25\text{ V}$
8.	Which type of ADC is the slowest type of ADC?			
	A	Dual Slope	B	Successive- Approximation
	C	Flash converter	D	Counter type
9.	<p>A safe has 5 Locks P, Q, R, S and T. All of which must be unlocked for the safe to open. The keys to the locks are distributed among five executives in the following manner.</p> <p>Mr. A has keys for locks P and R. Mr. B has keys for locks P and S. Mr. C has keys for locks Q and S. Mr. D has keys for locks R and T. Mr. E has keys for locks P and T.</p> <p>Which Boolean expression <math>f(A, B, C, D, E)</math> specifies when the safe can be opened as a function of what executives are present.</p>			
	A	$CAD+CAE+CBD+CDB$	B	$CAD+CBE+CBD+CDE$
	C	$CAD+CAE+CBD+CDE$	D	$CAD+CAB+CBD+CDB$



15.	Voltage shunt feedback amplifier is a			
	A	Differential amplifier	B	Voltage to current converter
	C	Non Inverting amplifier	D	Inverting amplifier
16.	The order of the system means			
	A	The number of mechanical OR Electrical component of the system	B	The number of Inputs of the system
	C	The order of low pass filter	D	The number of independent energy storage elements in the system
17.	The system do not have any poles means			
	A	The system is always stable	B	The system is FIR system
	C	The system is IIR system	D	Option A & B both
18.	For the Ramp input shown in below figure What is the output of PD (Proportional plus Derivative) controller? 			
	A		B	
	C		D	
19.	What is the characteristics of the Anti-aliasing filter?			
	A	Low Pass filter	B	Limit the frequency range
	C	Limit the additive noise spectrum	D	All above options

20.	What is the convolution of below given two sequences? $\uparrow$  $x(n) = \{ \underset{\uparrow}{1}, \underset{\uparrow}{2}, \underset{\uparrow}{3}, \underset{\uparrow}{2} \} \quad h(n) = \{ \underset{\uparrow}{1}, \underset{\uparrow}{2}, \underset{\uparrow}{1}, \underset{\uparrow}{-1} \}$			
	A	$\{ \underset{\uparrow}{1}, \underset{\uparrow}{4}, \underset{\uparrow}{3}, \underset{\uparrow}{-2} \}$	B	$\{ \underset{\uparrow}{2}, \underset{\uparrow}{6}, \underset{\uparrow}{2}, \underset{\uparrow}{-1} \}$
	C	$\{ \underset{\uparrow}{1}, \underset{\uparrow}{4}, \underset{\uparrow}{8}, \underset{\uparrow}{9}, \underset{\uparrow}{5}, \underset{\uparrow}{-1}, \underset{\uparrow}{-2} \}$	D	$\{ \underset{\uparrow}{1}, \underset{\uparrow}{2}, \underset{\uparrow}{6}, \underset{\uparrow}{2}, \underset{\uparrow}{4}, \underset{\uparrow}{3}, \underset{\uparrow}{-2} \}$
21.	For the analog signal $x(t) = 2 \cos 2000\pi t + 12 \sin 18000\pi t + 10 \cos 12000\pi t$ . The Nyquist sampling rate is			
	A	18 KHz	B	12 KHz
	C	24 KHz	D	36 KHz
22.	The DFT ( Discrete Fourier Transform) of shifted impulse signal $x(n) = \delta[n - 4]$ is ( note: k is index of DFT output in frequency domain, N is the number of samples of the input sequences and the number of frequency points in the DFT output)			
	A	$e^{-j8\frac{\pi k}{N}}$	B	$e^{-j2\frac{\pi k}{N}}$
	C	$e^{-j4\frac{\pi k}{N}}$	D	$e^{-j\frac{\pi k}{N}}$
23.	Which statement is true?			
	A	DFT convert time domain signal to frequency domain signal and FFT convert frequency domain signal to time domain signal.	B	FFT algorithm is very efficient to implement the DFT.
	C	DFT is applicable when sampling frequency is known and FFT is used when samples are infinite.	D	Option A & B
24.	Which z transform property is wrong?			
	A	$Z[nx[n]] \xleftrightarrow{z} -z \frac{dX[z]}{dz}$	B	$Z[a^n x[n]] \xleftrightarrow{z} X[a^{-1}z]$
	C	$Z[x[n - k]] \xleftrightarrow{z} z^{-k} X[z]$	D	$Z\left[\frac{x[n]}{n}\right] \xleftrightarrow{z} \int z^{-1} X[z] dz$

25.	Which statement is true for electrical activity of heart? ( Note : I means electrical potential of Lead –I, II means electrical potential of Lead –II And III means electrical potential of Lead –III)			
	A	I-II-III=0	B	I+II+III=0
	C	II-III-I=0	D	II+I-III=0
26.	The Transfer function $X[z] = \frac{1}{3}[1 + z^{-1} + z^{-2}]$ is referred to as			
	A	Notch filter	B	Band pass filter
	C	Low pass filter	D	All pass filter
27	In the case of Signal and Noise spectrum shown below			
				
	Which technique is suitable to remove noise?			
	A	Signal averaging	B	Band reject filter
28	C	Low Pass filter	D	Integer filter
	What is 10-20 system of electrode placement for clinical EEG recording?			
	A	The electrodes along the midline are placed at 10, 20, 10, 20, 10 and 20 % of total nasion-inion distance.	B	The electrodes along the midline are placed at 10, 20, 20, 20, 20 and 10 % of total nasion-inion distance.
29	C	The electrodes along the peripheral are placed at 10, 20, 20, 20, 20 and 10 % of total nasion-inion distance.	D	The electrodes along the peripheral are placed at 10, 20, 20, 20, 20 and 10 mm of nasion-inion distance.
	In PCG first heart sound is due to			
	A	The closure of semilunar valves	B	Sudden termination of the ventricular rapid filling phase
	C	The closing of the atrioventricular valves	D	Atrial contraction

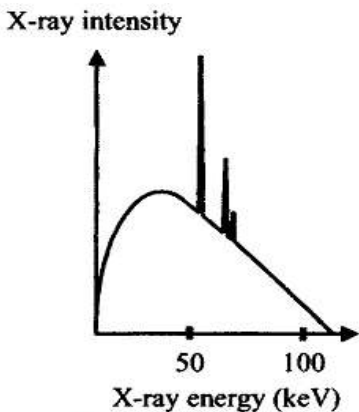
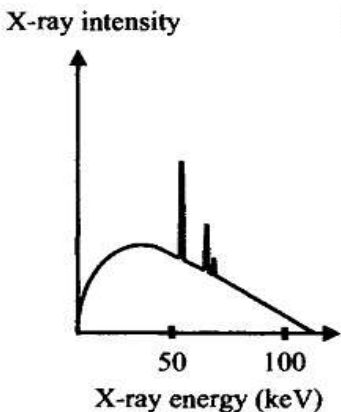
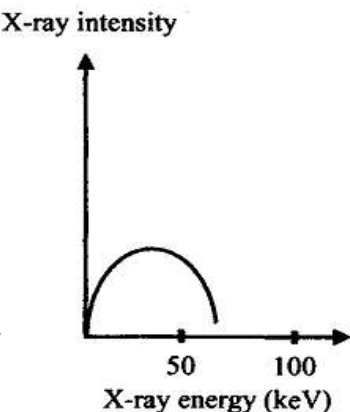
30	Which operation is suitable to remove low frequency artifacts from ECG?			
	A	Integral based processing	B	Derivative based processing
	C	Moving average operation	D	Option A & C
31	The Pan-Tompkins algorithm is used for			
	A	QRS complex detection in ECG	B	ST-segment elevation detection
	C	Removing noise from ECG	D	Dicrotic notch detection
32	Which tissues are covering the body and lining cavities and tubes in human body?			
	A	Connective tissue	B	Adipose tissue
	C	Epithelial tissue	D	Fibrous tissue
33	Once formed, red blood cells normally have an average life span of			
	A	150 days	B	50 days
	C	70 days	D	120 days
34	In a nerve fiber, the outermost layer is the			
	A	Schwann's white substance	B	neurilemma
	C	Myelin sheath	D	Peritoneal layer
35	Tendons help to join			
	A	Muscle to a muscle	B	Bone to a bone
	C	Muscle to a bone	D	Option A & C
36	Which one of the following pulmonary volume is difficult to calculate with the help of a simple spirometer only?			
	A	Residual volume	B	Inspiratory reserve volume
	C	Expiratory reserve volume	D	Tidal volume
37	Which of the following type of joint is present in the neck?			
	A	Pivot joint	B	Ball & socket joint
	C	Hinge joint	D	Gliding joint
38	Only movable bone in the skull is			
	A	Maxilla	B	Mandible
	C	Frontal	D	Vomer



39	Myopia is a defect of eyes in which			
	A	The diameter of eyeball is smaller than usual.	B	The diameter of eyeball is larger than usual.
	C	The curvature of cornea is irregular.	D	Lens become rigid
40	Largest endocrine gland is			
	A	Adrenal gland	B	Thymus gland
	C	Thyroid gland	D	Pituitary gland
41	Which EEG wave associated with deep sleep stages?			
	A	Delta	B	Alpha
	C	Theta	D	Beta
42	Which types of temperature transducers are Nonlinear and have best sensitivity?			
	A	Thermister , Thermister	B	Thermocouple, Thermister
	C	Thermister, RTD	D	Thermocouple, RTD
43	Which method of blood pressure monitoring gives maximum dynamic response?			
	A	Indirect Blood Pressure measurement	B	Intravascular–Direct blood pressure measurement
	C	Extravascular- Direct blood pressure measurement	D	Option B & C
44	Which techniques are used for information transmission in multi-channel wireless telemetry systems?			
	A	Frequency division multiplexing	B	Time division multiplexing
	C	Time-frequency conversion	D	Option A & B
45	The Beer –Lambart’s law is used in			
	A	Oximetry	B	Thermal Dilution techniques for cardiac output measurement
	C	Nuclear Magnetic resonance Blood flow meter	D	Pneumotachometer
46	Optical fiber can be used to measure following body parameters.			
	A	Temperature	B	Blood Pressure
	C	Blood flow	D	All of above

47	What is masking in Audiometry?			
	A	To place noise over better hearing ear while determining the threshold in the other.	B	To place signal to one ear for determining threshold of same ear.
	C	To place noise over better hearing ear while determining the threshold in the same ear.	D	To place signal to one ear for determining threshold of other ear.
48	What is the role of inductor in DC Defibrillator?			
	A	The inductor reduce the reverse flow of capacitor current and gives physiologically favorable shape to the output pulse.	B	The inductor slow down the discharge from capacitor and gives physiologically favorable shape to the output pulse.
	C	The inductor increase output impedance and gives physiologically favorable shape to the output pulse.	D	Option A & B
49	Which types of dialyzers most commonly used?			
	A	Parallel Flow Dialyzers	B	Hollow fibre Haemodialyzer
	C	Coil Haemodialyzer	D	Membrane Haemodialyzer
50	Modem is a device which			
	A	Transforms data ( Modulates) from a digital device to analog form suitable for transmission over such lines	B	Restores( demodulates) the data back to its original form
	C	Both A & B	D	None of above
51	From 2000 V source in series with a 20K $\Omega$ resistor, Calculate the time required to charge a 100 $\mu$ F defibrillator capacitor to 1.8 kV.			
	A	2.30 ms	B	0.9 s
	C	4.6 s	D	0.9 ms
52	Stefan-Boltzmann law is applicable for			
	A	Light transmission through change in medium	B	Ultrasound wave transmission through change in body tissue
	C	Pressure drop measurement across blockage of water pipe	D	Heat transfer by radiation
53	The medical application of coherent-fiber bundles is			

	A	endoscope	B	Direct blood pressure measurement
	C	Temperature measurement of internal parts of body	D	Tonometer
54	The Electroretinogram from a patient had a response to a flash light that was buried in the noise such that the SNR is 1:1. A computer algorithm can be used to average this response over many flashes to extract it from noise. What is the improved SNR if 100 such samples is averaged?			
	A	10	B	50
	C	100	D	150
55	Poisson's ratio for a metal is 0.4 Neglecting piezo-resistance effect, the gage factor of a strain gage made of this metal is			
	A	0.8	B	1
	C	1.4	D	1.80
56	The output voltage of a transducer with an output resistance of 100 k $\Omega$ is connected to an amplifier. The minimum input resistance of the amplifier so that the error in recording the transducer output does not exceed 2% is			
	A	4900 K $\Omega$	B	100 K $\Omega$
	C	102 K $\Omega$	D	1.02 M $\Omega$
57	The speed of gear having 60 teeth is measured using proximity sensor. The output of proximity sensor is fed to counter with gating of 1 sec. The counter indicate value of 120. The speed of rotating gear is.			
	A	60 rpm	B	120 rpm
	C	600 rpm	D	360 rpm
58	Value of pH of a solution is 6. It indicates that concentration of hydrogen ions is			
	A	10 <sup>-6</sup> g/litre	B	10 <sup>6</sup> mg/litre
	C	10 <sup>-6</sup> mg/litre	D	10 <sup>6</sup> g/litre
59	What is the need of filter in x-ray imaging technique?			
	A	To absorb the lower-energy x-ray photons emitted by the tube before they reach the target.	B	To absorb the lower-energy x-ray photons before they reach the detector.
	C	To remove x-ray noise photons emitted by the x-ray tube.	D	To remove scatter x-ray photons before they reach the detector.

60	A strain gauge has a nominal resistance of $500\ \Omega$ and a gauge factor of 2.5. The strain gauge is connected in a dc bridge with other resistance of $500\ \Omega$ each. The bridge is excited by a 10 V battery. If the strain gauge is subjected to a strain of $100\ \mu\text{m/m}$ , the magnitude of the bridge output will be			
	A	5 V	B	$500\ \mu\text{V}$
	C	125 mV	D	$625\ \mu\text{V}$
61	Among Bone and Muscle, Who have higher HVL (Half value Layer)? As the Energy of the incident X-Rays increase, is the value of HVL <u>Increase or Decrease</u> ?			
	A	Bone, Increase	B	Muscle, Decrease
	C	Muscle, Increase	D	Bone, Decrease
62	X-ray fluoroscopy is a			
	A	Continuous imaging technique using X-rays	B	Technique having low SNR.
	C	Technique using X-rays with very low energies	D	All of above
63	<p>In a below given Figure shows the intensity of X-rays produced from a source as a function of their energy. With respect to the reference graph shown on the left, one plot corresponds to a decrease in tube current and the other to a decrease in the accelerating voltage (kVp).</p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>Reference Graph</p> </div> <div style="text-align: center;">  <p>(A)</p> </div> <div style="text-align: center;">  <p>(B)</p> </div> </div>			
	A	(A), (B)	B	(A), (A)
	C	(B), (A)	D	Need more details to decide
64	For Ultrasound wave passing from one medium to another medium, Which pair of medium has high Intensity reflection coefficient RI?			
	A	Fat - Bone	B	Blood- Brain
	C	Air- fat	D	Bone- Air

65	In the case of piezoelectric single-crystal transducer, The acoustic impedance of skin is $Z_s$ and The acoustic impedance of crystal is $Z_c$ . The acoustic impedance of matching layer ( $Z_{ML}$ ) is			
	A	$Z_{ML} = \sqrt{\frac{Z_s + Z_c}{2}}$	B	$Z_{ML} = \sqrt{Z_s + Z_c}$
	C	$Z_{ML} = \sqrt{Z_s Z_c}$	D	$Z_{ML} = \sqrt{\frac{Z_s}{Z_c}}$
66	In Ultrasound imaging, The time-gain compensation (TGC) of the acquired signals is a process in which			
	A	The frequency change is increased as a function of time.	B	The amplification factor is increased as a function of time.
	C	The echo attenuation is increased as a function of time.	D	The intensity of transmitted ultrasound wave is increased as a function of time.
67	Which mode of Ultrasound imaging technique is most often used to determine the relative distance between different regions of the eye?			
	A	Mode A	B	Mode M
	C	Mode B	D	Mode B & M both
68	Out of below given option, which option is not a characteristics of electromagnetic waves?			
	A	They all travel at the speed of light $c = 3 \times 10^8$ m/sec.	B	Both the electrical and magnetic components have the same frequency.
	C	They all have two components—an electric field E and a magnetic field B—that are perpendicular to each other.	D	None of above options
69	Units for measuring nuclear activity are			
	A	Becquerel	B	Curie
	C	Coulomb	D	Option A & B
70	Coincidence detection of radiation circuit is used in			
	A	single-photon emission computerized tomography (SPECT)	B	Positron Emission Tomography (PET)
	C	Magnetic Resonance Imaging (MRI)	D	Gamma Camera

71	In computer programming, assembly language is also called as			
	A	Low level programming Language	B	Advanced programming Language
	C	High level programming Language	D	C programming Language
72	The program counter in the 8051, can access program addresses from			
	A	0000 to FFFFH	B	00 to 7FH
	C	00 to FFH	D	0000 to 7FFFH
73	The Degree of freedom (DOF) of the Hip joint is			
	A	1 DOF	B	3 DOF
	C	2 DOF	D	4 DOF
74	Silicone hydrogels is preferable compare to PMMA for Contact lenses because of			
	A	oxygen permeability	B	It make the lenses more hydrophilic
	C	Soft & flexibility	D	All above options
75	Which one is shape-memory alloy?			
	A	Nitinol	B	Copper oxide
	C	carbon-steel	D	Stainless steel
76	Transillumination is a			
	A	The detection of radiant emission from the skin surface.	B	Procedure using bright light in a dark room to see through certain body parts and organs.
	C	The measurement of light reflection using fiber optic.	D	None of above
77	Lithotripsy is a procedure that uses			
	A	X- ray energy	B	Nuclear radiation
	C	ultrasonic energy	D	Laser energy
78	The traditional long cane of blind people is example of			
	A	Tactual Vision Substitution	B	Vision Tactual Substitution
	C	Tactual Vision assistance	D	Vision Tactual assistance
79	Bioinformatics includes			
	A	Structural genomics	B	Functional genomics
	C	DNA Microarrays	D	All of above options

80	Linear attenuation coefficient of bone and water is 0.21 and 0.38 cm <sup>-1</sup> . An arbitrary integer K=1000. What is the CT number of Bone?			
	A	980	B	809
	C	710	D	170
81	Which of the following first order differential equations is non-homogeneous?			
	A	$x^2 \frac{dy}{dx} + xy = 0$	B	$x \frac{dy}{dx} + \sqrt{xy} = 0$
	C	$\frac{dy}{dx} = \frac{x+1}{y+1}$	D	None of these
82	If $f(x) = c$ represents the general solution of the differential equation  $((x+1)e^x - e^y)dx - (xe^y)dy = 0$ then			
	A	$f(x) = x(e^x - e^y)$	B	$f(x) = y(e^x - e^y)$
	C	$f(x) = (x+1)e^x - xe^y$	D	$f(x) = (x+1)e^x - e^y$
83	If the general solution of a second order homogeneous linear differential equation with constant coefficients is a linear combination of sine and cosine functions then its auxiliary equation has			
	A	Two distinct real roots	B	Two repeated real roots
	C	Complex roots with non-zero real part	D	Purely imaginary roots
84	If $z = f(x, y) = \tan^{-1}\left(\frac{x}{y}\right)$ , $x = u \cos v$ , $y = u \sin v$ then the value of  $\frac{\partial z}{\partial u}$ when $x = y = 1$ is			
	A	0	B	1
	C	$\pi$	D	$\frac{\pi}{4}$
85	If $f(x, y) = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$ then (5,1) is			
	A	A point of maxima	B	A point of minima
	C	A saddle point	D	None of these
86	The directional derivative of the function $f(x, y, z) = 4xz^3 - 3x^2y^2z$ at (0,0,1) along x-axis is			
	A	0	B	2
	C	4	D	8

87	$f(x) =  \cos x $ is not differentiable at			
	A	$x = 0$	B	$x = \frac{\pi}{2}$
	C	$x = \pi$	D	$x = 2\pi$
88	The improper integral $\int_0^1 \frac{dx}{1-x}$ is			
	A	Convergent and its value is 1	B	Convergent and its value is 0
	C	Convergent and its value is -1	D	Divergent
89	If $\vec{F} = 3\hat{i} + x\hat{j} + y\hat{k}$ , then $\text{curl}(\text{curl } \vec{F}) =$			
	A	$\vec{0}$	B	$3\hat{i}$
	C	$\hat{j}$	D	$\hat{k}$
90	Which of the following statements is true about the function $ z ^2$ ?			
	A	It is real valued	B	It is analytic in the complex plane $C$
	C	It is bounded in the complex plane $C$	D	None of these
91	At $z = 0$ , the function $\sin\left(\frac{1}{z}\right)$ has			
	A	A simple pole	B	A pole of order 2
	C	A pole of order 3	D	Essential singularity
92	If $A = \begin{bmatrix} 2 & 4 \\ 4 & 8 \end{bmatrix}$ then the value of n such that $A^8 = nA$ is			
	A	$10^6$	B	$10^7$
	C	$2^{24}$	D	$2^{12}$
93	Suppose A is a square matrix all whose eigen values are real and such that $A^4 = A$ . Then which of the following statements is true?			
	A	A cannot have negative eigen values	B	A cannot have positive eigen values
	C	0 must be the eigen value of A	D	None of these
94	Consider the system of linear equations $Ax = b$ where $A = \begin{bmatrix} 2 & -1 & 1 \\ 6 & -3 & 3 \end{bmatrix}$ and $b = \begin{bmatrix} 2 \\ 12 \end{bmatrix}$ . Then the system has			
	A	No solution	B	Unique solution
	C	More than one but finite number of solutions	D	Infinite solutions



95	Let $\alpha \in (2,3)$ . If the median of the data $3, -1, 4, \alpha, -4, 2\alpha$ is 2.8 then the value of $10\alpha$ is									
	A	22				B	24			
	C	26				D	28			
96	Consider the values of $y = f(x)$ as given in the table below. Then using the Simpson's $1/3$ rule the value of $\int_0^{80} f(x)dx$ is									
	$x$	0	10	20	30	40	50	60	70	80
	$y = f(x)$	0	4	7	9	12	15	14	8	7
	A	$\frac{2180}{3}$				B	$\frac{2170}{3}$			
	C	$\frac{2150}{3}$				D	$\frac{2140}{3}$			
97	The iteration formula for finding $\sqrt{N}$ is given by									
	A	$x_{n+1} = \frac{x_n^2 + N}{2x_n}$				B	$x_{n+1} = \frac{x_n + N}{2}$			
	C	$x_{n+1} = \frac{x_n + N^2}{2x_n}$				D	$x_{n+1} = \frac{x_n + N}{2x_n}$			
98	Which of the following is true for the one dimensional wave equation?									
	A	It is second order linear equation				B	It is first order linear equation			
	C	It is second order non-linear equation				D	It is first order non-linear equation			
99	The inverse Laplace transform of $F(s) = \frac{1}{(s-2)(s+3)}$ is									
	A	$\frac{e^{2t} - e^{-3t}}{5}$				B	$\frac{e^{-2t} - e^{3t}}{5}$			
	C	$\frac{e^{2t} - e^{-3t}}{2}$				D	$\frac{e^{-2t} - e^{3t}}{2}$			
100	The Laplace transform of $f(t) = \frac{1-\cos 2t}{t}$ is									
	A	$2\left(\log\left(\frac{s^2}{s^2+4}\right)\right)$				B	$\frac{1}{2}\left(\log\left(\frac{s^2}{s^2+4}\right)\right)$			
	C	$2\left(\log\left(\frac{s^2+4}{s^2}\right)\right)$				D	$\frac{1}{2}\left(\log\left(\frac{s^2+4}{s^2}\right)\right)$			