

PGCET-2022

Seat No. _____

SUB: INSTRUMENTATION & CONTROL ENGINEERING (IC)

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.	With negative feedback the system stability and system gain respectively			
	A	Increases and Increases	B	Increases and decreases
	C	Decreases and increases	D	Decreases and decreases
2.	A 10 μ F capacitor in series with a 1 M Ω resistor is connected across a 100 V DC supply. The initial rate of rise of voltage across the capacitor is			
	A	10 V/s	B	0.01 V/s
	C	1 V/s	D	0.1 V/s
3.	The D.C gain and steady state error for step input for $G(s) = (s+1) / (s^2 + s + 1)$ are:			
	A	1 and 1	B	0 and 1
	C	0 and 0	D	1 and 0.5
4.	The characteristic equation of a linear time – invariant (LTI) system is given by $s^4 + 3s^3 + 3s^2 + s + k = 0$. The system is BIBO stable if			
	A	$0 < k < 12/9$	B	$K > 3$
	C	$0 < k < 8/9$	D	$K > 6$
5.	Bode plot is applicable for			
	A	Minimum phase network	B	Non Minimum phase network
	C	All pass network	D	Every network of the control system
6.	The root locus of the feedback control system having the characteristic equation $S^2 + 6Ks + 2s + 5 = 0$ where $K > 0$, enters into real axis at			
	A	$s = -1$	B	$s = -\sqrt{5}$
	C	$S = -5$	D	$s = \sqrt{5}$
7.	A second order system represented by state variable has $A = \begin{bmatrix} -2 & -4 \\ 1 & 0 \end{bmatrix}$, The values of natural frequency and damping ratio are respectively			
	A	2 and 0.5	B	2 and 1

	C	1 and 2	D	0.5 and 2
8.	Which of the following is not an example of servomechanism?			
	A	Power steering for an automobile	B	Missile launcher
	C	Speed governor	D	Roll stabilization in ships
9.	The pole placement controller is used to control,			
	A	Single input single output system	B	Multi input multi output system
	C	Single input multi output system	D	All of above systems
10.	The transfer function of the phase lead compensator is $(1 + 3Ts) / (1 + Ts)$. The maximum value of phase provided by this controller is			
	A	90 Degree	B	60 Degree
	C	45 Degree	D	30 Degree
11.	In a non - linear control system, limit cycle is self – sustained oscillation of			
	A	Variable amplitude	B	Variable frequency
	C	Fixed frequency and amplitude	D	Fixed frequency
12.	The electric switch to control any electrical equipment will act as a			
	A	PD controller	B	On – Off controller
	C	P Controller	D	PID controller
13.	A condition where integral control drives the output of a controller into saturation is called			
	A	Repeat	B	Noise
	C	Wind up	D	Offset
14.	The controller which is highly sensitive to noise is			
	A	PI controller	B	PD controller
	C	P controller	D	Cascade controller
15.	Feed forward control system required the knowledge of			
	A	Disturbance signal	B	Noise signal
	C	Input signal	D	Output signal
16.	In Programmable Logic Controller, EQU, LES, LEQ instructions are examples of which of the following instructions?			
	A	Comparison Instructions	B	Sequencer instructions

	C	Data handling instructions	D	Composite instructions
17.	In DCS, which of the following PID Control structure is available for control law implementation?			
	A	Series PID control structure	B	Parallel PID control structure
	C	I – PD control structure	D	All of above
18.	In shell and tube heat exchanger, baffles are provided on the shell side to			
	A	Prevent the stagnation of shell side fluid	B	Improve heat transfer
	C	Provide support for the tubes	D	All of above
19.	Which electrical network produces a phase lag at one frequency region and a phase lead at another frequency region?			
	A	Lead network	B	Lag network
	C	Lead lag network	D	RC feedback network
20.	A state space representation of a system is given by $\dot{X} = \begin{bmatrix} -1 & 0 \\ 1 & -2 \end{bmatrix} X + \begin{bmatrix} 1 \\ 1 \end{bmatrix} U$ The system is			
	A	Controllable	B	Uncontrollable
	C	Controllable and observable	D	None of the above
21.	In the gas chromatographic technique, separation of molecules occurs on the basis of			
	A	Polarity and Molecular weight	B	Polarity
	C	Molecular weight	D	Chirality
22.	Which of the following properties is not possible in case of X – rays?			
	A	Polarization	B	Diffraction
	C	Interference	D	None of the above
23.	Which electromagnetic waves are mainly used as a treatment for cancer?			
	A	Alpha rays	B	Beta rays
	C	X –rays	D	Gamma rays
24.	The efficiency of an LED for generating light is directly proportional to the			
	A	Applied voltage	B	Current injected
	C	Temperature	D	Level of doping
25.	Which one of the following can be used as a photo detector in fiber optic communication?			

	A	Tunnel diode	B	LED
	C	PIN diode	D	LASER diode
26.	What is the use of an LED driver?			
	A	It converts DC to AC	B	It converts AC to DC
	C	It converts AC to AC	D	It converts DC to DC
27	Disturbance in the EEG pattern resulting from the external stimuli is called			
	A	Provoked response	B	Ckoored response
	C	Evoked response	D	Impulse response
28	In ECG, which of the following represents the depolarization of the ventricles?			
	A	P – wave	B	T – wave
	C	QRS Complex	D	PQ Interval
29	SONAR stands for			
	A	Sound navigation and ranging	B	Sound number approximation and ranging
	C	Sound nullifying ranging	D	None of these
30	In order to visualize the flow of blood in the renal arteries, what process is done with CT?			
	A	CT Angioplasty	B	CT Angiography
	C	Simple CT	D	CT Cardiography
31	Thermal compensation in a Wheatstone can be provided by			
	A	Using more than one resistive sensor	B	Making use of a heat sink
	C	Using cooling fans	D	Immersing the circuit into a liquid
32	Which of the following quantity cannot be measured by capacitive transducers?			
	A	Displacement	B	Speed
	C	Moisture	D	None of these
33	The output of LVDT is in the form of			
	A	Pulses	B	High frequency signals
	C	Rotary movement of core	D	Linear displacement of core
34	Which of the following transducers measures the pressure by producing emf as a function of its deformation?			
	A	Piezoelectric transducer	B	Capacitive transducer

	C	Inductive transducer	D	Photoelectric transducer
35	The transducer employed for measurement of angular displacement is			
	A	LVDT	B	Thermocouple
	C	Thermistor	D	Circular potentiometer
36	Which of the following devices convert pressure to displacement?			
	A	Diaphragm	B	Bellow
	C	Capsule	D	Both diaphragm and capsule
37	In Flow measurement, a venturi meter is preferable to orifice meter because			
	A	It is cheaper	B	It is more convenient
	C	Energy loss is less	D	It is easy to assemble
38	Optical pyrometer is generally used to measure			
	A	Low pressure	B	Low temperature
	C	High temperature	D	High pressure
39	Which of the following is a direct method of level measurement?			
	A	Laser level sensor	B	Air purge system
	C	Ultrasonic level detector	D	Sight glass system
40	Which of the following is the simplest of pH meters?			
	A	Null – detector type pH meter	B	Direct reading type pH meter
	C	Digital pH meter	D	Modern pH meter
41	What happens to the viscosity of liquid and gas when the temperature is increased?			
	A	Both increases	B	Both decreases
	C	For liquid increases and for gas decreases	D	For liquid decreases and gas increases
42	Which of the following medical imaging modality other than ultrasound does not use any form of radiation?			
	A	PET scan	B	SPECT scan
	C	CT scan	D	MRI
43	The number of equations required to be analyzed in a given network by nodal analysis is equal to			
	A	One less than the number of nodes	B	One less than the number of loops
	C	The number of nodes	D	The number of independent loops

44	For a two port network, the condition of symmetry in terms of Z – parameters is			
	A	$Z_{12} = Z_{21}$	B	$Z_{11} = Z_{22}$
	C	$Z_{11} = Z_{21}$	D	$Z_{12} = Z_{22}$
45	A wattmeter reads 25.34. The absolute error in measurement is 0.11 W. What is the true value of power?			
	A	25.23 W	B	25.45W
	C	-25.23 W	D	-25.45
46	In curve fitting, departure from the straight line relationship is			
	A	Linearity	B	Stiction
	C	Drift	D	Non linearity
47	In an n-p-n transistor operating in saturated mode, the output voltage V_{CE} is			
	A	Greater than $2 V_{BE}$	B	Between $2 V_{BE}$ and V_{BE}
	C	Less than V_{BE}	D	Equal to V_{BE}
48	The main drawback of JFET is its			
	A	High input impedance	B	Low input impedance
	C	Higher noise	D	Lower gain
49	Which of the following is a faster switching device?			
	A	MOSFET	B	JFET
	C	BJT	D	Triode
50	The amount of Ac content present in the Dc output of a rectifier is given by			
	A	Power factor	B	Ripple factor
	C	Form factor	D	Peak factor
51	Which diode has negative resistance region in its characteristics?			
	A	Tunnel diode	B	Photo diode
	C	Varactor diode		Zener diode
52	What is the input impedance of a transistor circuit if $I_1 = 10 \text{ mA}$, $I_2 = 20 \text{ mA}$, $V_1 = 25 \text{ V}$ and $V_2 = 15 \text{ V}$?			
	A	0.5 k Ω	B	2 k Ω
	C	1.5 k Ω	D	2.5 k Ω

53	An amplifier gain of 10,000,000 times in power is expressed as			
	A	60 db	B	80 db
	C	70 db	D	120 db
54	CMRR for an Operational amplifier should be			
	A	Close to zero	B	As large as possible
	C	Close to unity	D	As small as possible
55	An Op – amp as a voltage follower has a voltage gain of			
	A	Infinity	B	Zero
	C	Unity	D	Less than unity
56	In an instrumentation amplifier using transducer bridge, which device measure the change in physical energy?			
	A	Resistive transducer	B	Indicating meter
	C	Capacitive transducer	D	Inductor circuit
57	Which of the following is the fastest A/D converter?			
	A	Counter type A/D	B	Successive approximation
	C	Dual slope	D	Flash type
58	A resolution of an 8 bit DAC will be			
	A	1/255	B	1/8
	C	1/128	D	1/64
59	Feedback control system is basically a			
	A	Band pass filter	B	High pass filter
	C	Low pass filter	D	Band stop filter
60	A colpitts oscillator generates			
	A	Square waves	B	Sine waves
	C	Saw – tooth waves	D	Damped waves
61	Half adder is also known as			
	A	NAND	B	AND
	C	NOT	D	XOR
62	An acceptable voltage range of a logic 0 for TTL is			

	A	0 to 0.8 V	B	0 to 1.5 V
	C	2 to 5 V	D	3.5 to 5 V
63	Using which of the following technologies, the charge – coupled devices are implemented?			
	A	MOS technology	B	CMOS technology
	C	PMOS technology	D	NMOS technology
64	The basic building blocks of the arithmetic unit in digital computers are			
	A	Subtractors	B	Adders
	C	Multiplexer	D	Comparator
65	For which of the following functions, can a Schmitt trigger be used?			
	A	Blocking	B	Amplification
	C	Filtering	D	Pulse shaping
66	In which sequential circuit, a race – around condition occurs?			
	A	Multiplexer	B	ROM
	C	Flip Flops	D	Voltage regulator
67	Three T flip flops are connected to form a counter. The maximum states possible for the counter will be			
	A	5	B	3
	C	8	D	7
68	In which of the following circuit, the flip flop output transition serves as a source of triggering other flip flops?			
	A	Shift register	B	Ripple counter
	C	Serial adder	D	Parallel adder
69	To carry out multiple shift operation in a single clock cycle,			
	A	Serial shift registers are used	B	Parallel shift registers are used
	C	Phase locked loop are used	D	Barrel shift registers are used
70	When a time –varying signal has to be digitized using an ADC, which of the following is necessary to use before digitization?			
	A	Sample and hold circuit	B	Frequency division multiplexer
	C	Time division multiplexer	D	Instrument amplifier
71	In 8085 microprocessor, which are 16 bit registers?			

	A	Stack counter and accumulator	B	Program counter and accumulator
	C	Stack pointer and program counter	D	Accumulator, stack pointer and program counter
72	Which of the following factors are to be considered while selecting a microcontroller? 1. Memory requirement 2. Processing speed requirement 3. Number of I/O pins			
	A	1 and 2 only	B	1 and 3 only
	C	2 and 3 only	D	1,2 and 3
73	If the impulse response of LTI system is a unit step function, then corresponding transfer function is			
	A	S	B	1/S
	C	1/(S+1)	D	S / (S+1)
74	The fundamental period of discrete – time signal $x(n) = (-1)^n$ is			
	A	2	B	4
	C	6	D	3
75	An amplitude modulated signal has a carrier frequency of 10 kHz. The upper sideband is transmitted at 11 kHz. The bandwidth required for the AM signal to transmit is			
	A	10 kHz	B	11 kHz
	C	2 kHz	D	1 kHz
76	To satisfy the sampling theorem, a 100 Hz sine wave should be sampled at			
	A	10 Hz	B	100 Hz
	C	200 Hz	D	50 Hz
77	Which of the following is an advantage of the analog multimeter over the digital multimeter?			
	A	No loading effect	B	High accuracy
	C	Smaller size	D	Less electric noise
78	Which of the following devices is used to convert pressure into displacement?			
	A	Capsule	B	Bellow
	C	Convers	D	Jockey
79	Cathode ray oscilloscope cannot be used to measure			
	A	Frequency	B	Phase
	C	Power	D	Voltage
80	Frequency shift keying is used mostly in			

	A	Radio transmission	B	Telegraphy
	C	Telephony	D	Television
81	Which of the following matrix is in reduced row echelon form?			
	A	$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{bmatrix}$	B	$\begin{bmatrix} 1 & 4 & 5 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$
	C	$\begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 3 \\ 0 & 0 & 0 \end{bmatrix}$	D	none of these
82	The system of linear equations $x + y + 2z = 9$, $2x + 4y - 3z = 1$, $3x + 6y - 5z = 0$ has			
	A	a unique solution	B	infinitely many solutions
	C	no solution	D	none of above
83	If $y e^x dx + (2y + e^x) dy = 0$, where $y(0) = -1$ be an exact differential equation then the particular solution is given by			
	A	$e^x + y = -1$	B	$y e^x + y^2 = 0$
	C	$y e^x + x^2 = 0$	D	none of these
84	What is an integrating factor of $\frac{dy}{dx} + \frac{1}{x} = \frac{e^y}{x^2}$?			
	A	$\frac{1}{x}$	B	$-\log x$
	C	$-\frac{1}{x}$	D	$\log x$
85	The particular solution of $\frac{d^2 y}{dx^2} + 2\frac{dy}{dx} + 2y = 0$, where $y(0) = 1$ and $y\left(\frac{\pi}{2}\right) = 0$ is.....			
	A	$y = e^{-x}(\cos x + \sin x)$	B	$y = e^x(\cos x + \sin x)$
	C	$y = e^{-x} \sin x$	D	$y = e^{-x} \cos x$
86	The Wroskian of $\frac{d^2 y}{dx^2} + 3\frac{dy}{dx} + 2y = f(x)$ is...			
	A	$-e^{3x}$	B	e^{-x}

	C	$-e^{-3x}$	D	e^{3x}
87	If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ then $\text{div } \vec{r} = \dots$			
	A	\vec{r}	B	3
	C	$x + y + z$	D	none of these
88	For a vector field \vec{F} , if there exists a scalar potential function ϕ such that $\vec{F} = \text{grad } \phi$ then \vec{F} is called.....			
	A	a rotational field	B	conservative field
	C	scalar field	D	none of these
89	The Laplace transform of $\frac{\sin 2t}{t}$ is			
	A	$\cot^{-1}\left(\frac{s}{2}\right)$	B	$-\tan^{-1}\left(\frac{s}{2}\right)$
	C	$\frac{\pi}{2} + \tan^{-1}\left(\frac{s}{2}\right)$	D	$\frac{\pi}{2} - \cot^{-1}\left(\frac{s}{2}\right)$
90	Which of the following methods is not a direct method for solving a system of simultaneous linear equations?			
	A	Gauss elimination	B	Gauss-Jordan
	C	relaxation	D	Cramer's
91	Newton-Raphson method for solving non-linear equations numerically is also known as.....			
	A	Regula Falsi method	B	False position method
	C	method of tangents	D	Secant method
92	The formula of numerical integration obtained from Newton-Cotes' quadrature formula by putting $n = 6$ is known as			
	A	Simpson's one-third rule	B	Weddle's rule
	C	Simpson's three-eighth rule	D	Gaussian quadrature formula
93	Which of the following methods is one of the predictor-corrector methods to solve first order linear differential equation numerically?			
	A	Picard's method	B	Runge-Kutta fourth order method
	C	Taylor's series method	D	Adams-Bashforth method
94	Which of the following functions is nowhere differentiable?			

	A	iz	B	e^z
	C	$\frac{-}{z}$	D	iz^3
95	A bounded entire function is constant. This is stated in theorem.			
	A	Cauchy's integral	B	Cauchy's residue
	C	Liouville's	D	Morera's
96	The coefficient of z^{-1} in the Laurent's expansion of $f(z) = \frac{1}{(1-z)(z-2)}$ in the range $1 < z < 2$ is...			
	A	does not exist	B	1
	C	$\frac{1}{4}$	D	$\frac{1}{2}$
97	The function $f(x, y) = x^2 + 2y^2 - 2xy - 2x + 2y + 1$ has			
	A	local maxima at (1, 0)	B	local maximum value is equal to 0
	C	local minima at (1, 0)	D	all of above
98	The first four moments of a distribution about the assumed mean $x = 4$ are 1, 4, 10 and 45. The mean of the distribution is.....			
	A	5	B	4
	C	3	D	0
99	Bag I contains 3 red and 4 black balls, while Bag II contains 5 red and 6 black balls. One ball is drawn at random from one of the bags and it is found to be red. The probability that it was from bag II is			
	A	$\frac{3}{7}$	B	$\frac{34}{77}$
	C	$\frac{5}{11}$	D	$\frac{35}{68}$
100	Suppose you are taking another multiple choice test in Mathematics. The test consists of 40 questions, each of 5 options. If you guess at all 40 questions, then what is the standard deviation of the number of correct answers?			
	A	8	B	6.3998
	C	2.5298	D	none of these