

# NADAR SARASWATHI COLLEGE OF ENGINEERING AND TECHNOLOGY, THENI.

<b>Course/Branch</b> : BE /ECE	<b>Year / Semester</b> : II/III	Format No.	NAC/TLP-07a.13
<b>Subject Code</b> : EC8391	<b>Subject Name</b> : CONTROL SYSTEMS ENGINEERING	Rev. No.	02
<b>Unit No</b> : 5	<b>Unit Name</b> : STATE VARIABLE METHODS	Date	30.09.2020

## OBJECTIVE TYPE QUESTION BANK

S. No.	Objective Questions (MCQ /True or False / Fill up with Choices )	BTL
1.	I): Aliasing occurs when the sampling frequency is less than twice the maximum frequency in the signal. Statement (II): Aliasing is a reversible process. a) Both statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I). b) Both Statement (I) and Statement (II) are individually true but Statement (II) is not correct explanation of Statement (I) c) <b>Statement (I) is true but Statement (II) is false</b> d) Statement (I) is False but Statement (II) is true	L2
2.	A band limited signal with a maximum frequency of 5 KHz to be sampled. According to the sampling theorem, the sampling frequency which is not valid is: a) <b>5 KHz</b> b) 12 KHz c) 15 KHz d) 20 KHz	L3
3.	Let $x(t)$ be a continuous-time, real valued signal band-limited to $F$ Hz. The Nyquist sampling rate in Hz, For $y(t) = x(0.5t) + x(t) - x(2t)$ is a) $F$ b) $2F$ c) <b><math>4F</math></b> d) $8F$	L3
4.	Increased pulse-width in the flat-top sampling leads to: a) <b>Attenuation of high frequencies in reproduction</b> b) Attenuation of low frequencies in reproduction c) Greater aliasing errors in reproduction d) No harmful effects in reproduction	L1
5.	A bandpass sampling extends from 4-6 kHz. What is the smallest sampling frequency required to retain all the information in the signal. a) 1 kHz b) 2 kHz c) 3 kHz d) <b>4 kHz</b>	L3
6.	A signal represented by $x(t) = 5\cos 400\pi t$ is sampled at a rate 300 samples/sec. The resulting samples are passed through an ideal low pass filter of cut-off frequency 150 Hz. Which of the following will be contained in the output of the LPF? a) <b>100 Hz</b> b) 100 Hz, 150 Hz c) 50 Hz, 100 Hz d) 50 Hz, 100 Hz, 150 Hz	L3
7.	A signal $m(t)$ with bandwidth 500 Hz is first multiplied by a signal $g(t)$ . The resulting signal is passed through an ideal low pass filter with bandwidth 1 kHz. The output of the low pass filter would be : a) Impulse b) $m(t)$	L3

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	c) 0 d) $m(t)\delta(t)$		
8.	<p>An LTI system having transfer function <math>s^2+1/s^2+2s+1</math> and input <math>x(t) = \sin(t+1)</math> is in steady state. The output is sampled at <math>\omega_s</math> rad/s to obtain the final output <math>\{y(k)\}</math>. Which of the following is true?</p> <p>a) <b>Y is zero for all sampling frequencies <math>\omega_s</math></b>                  b) Y is non zero for all sampling frequencies <math>\omega_s</math>                  c) Y is non zero for <math>\omega_s &gt; 2</math> but zero for <math>\omega_s &lt; 2</math>                  d) Y is zero for <math>\omega_s &gt; 2</math> but non zero for <math>\omega_s &lt; 2</math></p>	L3	
9.	<p>A digital measuring instrument employs a sampling rate of 100 samples/second. The sampled input <math>x(n)</math> is averaged using the difference equation:  <math>Y(n) = [x(n) + x(n-1) + x(n-2) + x(n-4)]/4</math> For a step input, the maximum time taken for the output to reach the final value after the input transition is</p> <p>a) 20 ms                  b) <b>40 ms</b>                  c) 80 ms                  d) <math>\infty</math></p>	L3	
10.	<p>The sinusoid <math>x(t) = 6\cos 10\pi t</math> is sampled at the rate of 15 Hz and applied to ideal rectangular LPF with cut-off frequency of 10 Hz, then the output of filter contains:</p> <p>a) Only <math>10\pi</math> rad/sec component                  b) <b><math>10\pi</math> rad/sec component</b>                  c) <math>10\pi</math> rad/sec and <math>20\pi</math> rad/sec components                  d) <math>+10\pi</math> rad/sec and <math>+20\pi</math> rad/sec components</p>	L3	
11.	<p>Sampling can be done by:</p> <p>a) Impulse train sampling                  b) Natural sampling                  c) Flat-top sampling                  d) <b>All of the mentioned</b></p>	L1	
12.	<p>The first step required to convert analog signal to digital is :</p> <p>a) <b>Sampling</b>                  b) Holding                  c) Reconstruction                  d) Quantization</p>	L1	
13.	<p>Sampling is necessary :</p> <p>a) In complex control systems                  b) <b>Where high accuracy is required</b>                  c) Non automated control systems                  d) Automated control system</p>	L1	
14.	<p>Sampled data technique is appropriate as:</p> <p>a) For long distance data transmission                  b) Pulses are transferred by little loss of accuracy                  c) More than one channel of information is sequentially sampled and transmitted.                  d) <b>All of the mentioned</b></p>	L1	
15.	<p>Signal sampling reduces the power demand made on the signal.</p> <p>a) <b>True</b></p>	L2	

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	b) False	
16.	The use of sampled data control system are: a) For using analog components as the part of the control loop b) For time division of control components c) <b>Whenever a transmission channel forms a part of closed loop</b> d) None of the mentioned	L2
17.	_____ is a sampling pattern which is repeated periodically a) Single order sampling b) <b>Multi order sampling</b> c) Zero order sampling d) Unordered sampling	L1
18.	For the successful reconstruction of signals : a) Sampling frequency must be equal to the message signal b) Sampling frequency must be greater to the message signal c) Sampling frequency must be less to the message signal d) <b>Sampling frequency must be greater than or equal to the message signal</b>	L1
19.	The signal is reconstructed back with the help of a) Zero order hold circuits b) Extrapolations c) <b>Signal is reconstructed with zero order holds and extrapolations</b> d) Signal is not reconstructed	
20.	Aliasing is caused when: a) Sampling frequency must be equal to the message signal b) Sampling frequency must be greater to the message signal c) <b>Sampling frequency must be less to the message signal</b> d) Sampling frequency must be greater than or equal to the message signal	L2
21.	The transfer function for the state representation of the continuous time LTI system: $\frac{dq(t)}{dt} = Aq(t) + Bx(t)$ $Y(t) = Cq(t) + Dx(t)$ is given by: a) <b><math>C(sI-A)^{-1}B+D</math></b> b) $B(sI-A)^{-1}B+D$ c) $C(sI-A)^{-1}B+A$ d) $D(sI-A)^{-1}B+C$	L3
22.	System transformation on function $H(z)$ for a discrete time LTI system expressed in state variable form with zero initial condition a) <b><math>C(zI-A)^{-1}B+D</math></b> b) $C(zI-A)^{-1}$ c) $(zI-A)^{-1}z$ d) $(zI-A)^{-1}$	L3
23.	When human being tries to approach an object, his brain acts as, a) An error measuring device b) <b>A controller</b> c) An actuator d) An amplifier	L1

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24.	A differentiator is usually not a part of a control system because it a) Reduces damping b) Reduces the gain margin c) <b>Increases input noise</b> d) Increases error	L1
25.	If the gain of the critical damped system is increased it will behave as a) Oscillatory b) Critically damped c) Overdamped d) <b>Underdamped</b>	L1
26.	In a control system integral error compensation _____ steady state error a) Increases b) <b>Minimizes</b> c) Does not have any effect on d) All of the mentioned	L1
27.	With feedback _____ reduces. a) System stability b) <b>System gain</b> c) System stability and gain d) None of the mentioned	L1
28.	A system is said to be _____ if it is possible to transfer the system state from any initial state to any desired state in finite interval of time. a) <b>Controllable</b> b) Observable c) Cannot be determined d) Controllable and observable	L1
29.	A system is said to be _____ if every state can be completely identified by measurements of the outputs at the finite time interval. a) Controllable b) <b>Observable</b> c) Cannot be determined d) Controllable and observable	L1
30.	Kalman's test is for : a) Observability b) Controllability c) Optimality d) <b>Observability and controllability</b>	L1
31.	Consider a system if represented by state space equation and $x_1(t) = x_2(t)$ , then the system is: a) Controllable b) <b>Uncontrollable</b> c) Observable d) Unstable	L1

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32.	<p style="text-align: center;"><math display="block">\dot{X} = \begin{bmatrix} 2 &amp; 3 \\ 0 &amp; 5 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u</math></p> <p>For the system , which of the following statements is true?</p> <p>a) The system is controllable but unstable  b) <b>The system is uncontrollable and unstable</b>  c) The system is controllable and stable  d) The system is uncontrollable and stable</p>	L2
33.	<p>A transfer function of the system does not have pole-zero cancellation? Which of the following statements is true?</p> <p>a) System is neither controllable nor observable  b) <b>System is completely controllable and observable</b>  c) System is observable but uncontrollable  d) System is controllable and unobservable</p>	L1
34.	<p>Complex conjugate pair:</p> <p>a) Center  b) <b>Focus point</b>  c) Saddle point  d) Stable node</p>	L1
35.	<p>Pure imaginary pair:</p> <p>a) <b>Centre</b>  b) Focus point  c) Saddle point  d) Stable node</p>	L1
36.	<p>Real and equal but with opposite sign.</p> <p>a) Center  b) Focus point  c) <b>Saddle point</b>  d) Stable node</p>	L1
37.	<p>Real distinct and negative.</p> <p>a) Center  b) Focus point  c) Saddle point  d) <b>Stable node</b></p>	L1
38.	<p>A control system in which the control action is somehow dependent on the output is known as</p> <p>a) <b>Closed loop system</b>  b) Semi closed loop system  c) Open system  d) Non feedback control system</p>	L1
39.	<p>In closed loop control system, with positive value of feedback gain the overall gain of the system will</p> <p>a) Decrease  b) <b>Increase</b>  c) Be unaffected  d) Exponentially increase</p>	L1

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40.	Which of the following statements is not necessarily correct for open control system? a) Input command is the sole factor responsible for providing the control action b) <b>Presence of non-linearities causes malfunctioning</b> c) Less expensive d) Generally free from problems of non-linearities	L2
41.	In open loop system a) The control action depends on the size of the system b) The control action depends on system variables c) The control action depends on the input signal d) <b>The control action is independent of the output</b>	L1
42.	_____ has tendency to oscillate. a) <b>Open loop system</b> b) Closed loop system c) Open and closed loop systems have tendency to oscillate d) No Systems have tendency to oscillate	L1
43.	A good control system has all the following features except a) Good stability b) <b>Slow response</b> c) Good accuracy d) Sufficient power handling capacity	L1
44.	The initial response when the output is not equal to input is called a) <b>Transient response</b> b) Error response c) Dynamic response d) All of the mentioned	L1
45.	A control system working under unknown random actions is called a) Computer control system b) Digital data system c) <b>Stochastic control system</b> d) Adaptive control system	L1

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