University of Mumbai

Examination 2021 under cluster __ (Lead College: _____)

Examinations Commencing from 1st June 2021 to 10th June 2021

Program: **BE (Electronics and Telecommunication Engineering)**

Curriculum Scheme: Rev2016

Examination: SE Semester IV

Course Code: ECC401 and Course Name: Applied Mathematics IV

Time: 2 hours Max. Marks: 80

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Note: All Questions are compulsory

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	If y(x) is the extremal of the functional I=$\int_{x1}^{x2} F(x,y,y')dx$ it satisfies--
Option A:	$\frac{\partial F}{\partial y'} - \frac{d}{dx}\left(\frac{\partial F}{\partial y}\right) = 0$
Option B:	$\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) = 0$
Option C:	$\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y}\right) = 0$
Option D:	$\frac{d}{dx}\left(\frac{\partial F}{\partial y}\right) - \frac{\partial F}{\partial y'} = 0$
2.	If a particle in the absence of friction will slide from one point to another in the shortest time under the action of gravity, then the path is
Option A:	a right circular cone
Option B:	a cone
Option C:	a cylinder
Option D:	a Cycliod
3.	What is the Extremal of the function I[y(x)]=$\int_{x1}^{x2} \frac{y'^2}{x^3} dx$
Option A:	$y = Ax^3+B$
Option B:	$y = Ax^4+B$
Option C:	$y = Ax^2+B$
Option D:	$y = Ax^3+Bx^4+C$
4.	Which of the following is true ?
Option A:	Q is a vector space over Z
Option B:	Q is a vector space over Q
Option C:	Q is a vector space over R
Option D:	Q is a vector space over C
5.	Which of the following set of vector in R^3 is Linearly Independent ? 1. {(1,0,0),(0,1,0),(1,1,0)} 2. {(1,0,0),(0,1,0),(0,0,1)}

	3. {(0,1,0),(1,0,1),(1,1,0)} 4. {(0,0,1),(0,1,0),(0,1,1)} Select the correct answer using the codes given below:
Option A:	1 and 2
Option B:	2 and 3
Option C:	3 and 4
Option D:	1 and 4
6.	R^n is …… Space over
Option A:	Not a vector
Option B:	Not subspace
Option C:	Not metric
Option D:	A vector
7.	The Characteristic Equation of A=$\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$
Option A:	$\lambda^2+5\lambda+7$
Option B:	$\lambda^2-2\lambda+7$
Option C:	$\lambda^2-3\lambda+7$
Option D:	$\lambda^2+\lambda+7$
8.	The Sum of the Eigen Value of A=$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$
Option A:	5
Option B:	7
Option C:	9
Option D:	18
9.	Eigen Value of the Matrix S=$\begin{bmatrix} 3 & 2 \\ 2 & 3 \end{bmatrix}$ are 5 and 1 . What are the eigen value of S^3 ?
Option A:	1,5
Option B:	1,25
Option C:	1,125
Option D:	-1,-125
10.	Probability can take the values from -
Option A:	$-\infty$ to $+\infty$
Option B:	$-\infty$ to 1
Option C:	0 to 1
Option D:	-1 to +1
11.	Two events are said to be independent if -
Option A:	Each out come has equal chance of occurrence.
Option B:	There is the common point in between them.
Option C:	One does not affect the occurrence of other.
Option D:	Both events have only one point.

12.	In Normal Distribution :
Option A:	Mean= Median = Mode
Option B:	Mean< Median < Mode
Option C:	Mean> Median > Mode
Option D:	Mean> Median <Mode
13.	The mean and variance of binomial distribution are 8 and 4 respectively. Then P[X=1] is equal to
Option A:	$1/2^{12}$
Option B:	$1/2^{4}$
Option C:	$1/2^{6}$
Option D:	$1/2^{8}$
14.	The mean of Poisson Variate is……. Variance.
Option A:	Greater than
Option B:	Less than
Option C:	Equal to
Option D:	Twice its variance.
15.	The correlation is the ……. Of two regression coefficients :
Option A:	Geometric Mean
Option B:	Arithmetic mean
Option C:	Harmonic Mean
Option D:	Median.
16.	If both variables X and Y increase or decrease simultaneously, then the coefficient of correlation will be :
Option A:	Positive
Option B:	Negative
Option C:	Zero
Option D:	One
17.	Which of the following would not allow you to calculate a correlation ?
Option A:	A negative relationship between X and Y
Option B:	A Positive relationship between X and Y
Option C:	A curvilinear relationship between X and Y.
Option D:	A Linear relationship between X and Y
18.	If C is closed contour $\|z\|=r$ and $n\neq -1$, then $\int z^n = ?$ over C.
Option A:	$2\pi i$
Option B:	0
Option C:	2i
Option D:	i
19.	If $f(z) = \frac{z^2+5z+6}{z-2}$, and the path of integration is a circle C of radius 1and center at origin then $\int_c f(z)dz = ?$
Option A:	0

Option B:	Not equal to 0
Option C:	2i
Option D:	2
20.	Find the value of the integral $\int_0^{1+i}(x-y+ix^2)dz$ along a straight line z=0 to z=1+i.
Option A:	(i-1)/3
Option B:	i-1
Option C:	$(i-1)^2$
Option D:	0

Subjective/Descriptive questions

Q2 . **(20 Marks Each)**	**Solve any Four** **5 marks each**
1	Find the Extremal of the curve I[y(x)] =$\int_0^1\{(y')^2+12xy\}dx$,y(0)=0 and y(1)=1.
2	Let R^4 have Euclidean inner product. Find the cosine of the angle between vectors u=(4,3,1,-2) and v=(-2,1,2,3)
3.	Evaluate $\int_c \frac{Sin\,\pi z^2+\cos\pi z^2}{(z-2)(z-3)}dz$, Where C is the Circle |z|=4.
4	Daily income of worker follows normal distribution with Rs. 1000. And Standard deviation Rs. 100. Find probability of income i) less than 1100 Rs. ii) More than 1100Rs. [given P(z=1)=0.3413)]
5	Verify that the matrix $A=\begin{bmatrix}1 & 2 & 0\\ 2 & -1 & 0\\ 0 & 0 & -1\end{bmatrix}$ satisfies the characteristic equation, Hence find A^{-2}
6	Obtain two distinct Laurent's series for $\frac{2z-3}{z^2-4z+3}$ in powers of (z – 4) indicating the regions of convergence.

Q3. **(20 Marks Each)**	**Solve any Four** **5 marks each**
i.	Find the Unit Vector orthogonal to the both (1,1,0) and (0,1,1)
ii.	Find the Probability that at most 4 defective bulbs will be found in a box of 200 bulbs if it is known that 2 percent of the bulbs are defective. ***(Given $e^{-4} = 0.0183$)***
iii.	Find the Extremal of the curve I[y(x)] =$\int_0^{\frac{\pi}{2}}\{((y')^2 - y^2 + 2xy)\}dx$,y(0)=0 and y($\frac{\pi}{2}$)=0.
iv.	Find $A^7 - 4A^6 - 20A^5 - 34A^4 - 4A^3 - 20A^2 - 33A + 2I$ where $A = \begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$
v.	Evaluate $\int_0^{1+i} z^2 dz$ along (i) line $y = x$ (ii) parabola$x = y^2$.
vi.	From the following data calculate the coefficient of rank correlation coefficient between X and Y. ***X: 32,55,49,60,43,37,43,49,10,20*** ***Y:40,30,70,20,30,50,72,60,45,25***

University of Mumbai

Examination 2020 under cluster 5 (Lead College: APSIT)

Examinations Commencing from 1st June 2021

Program: **Electronics & Telecommunication**

Curriculum Scheme: Rev 2016

Examination: SE Semester IV

Course Code: ECC402 and Course Name: Electronic Devices & Circuits-II

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	On which parameters, the calculation of Q point in designing of CS-CS multistage amplifiers is dependent?
Option A:	I_{DQ}, V_{GSQ}
Option B:	V_{DSQ}, I_{DQ}
Option C:	V_{DSQ}, V_{GSQ}
Option D:	V_{GSQ}, I_{GQ}
2.	In designing of CS-CE multistage amplifier if the lower cut-off frequency is 30 Hz, X_{CE2} = 500 Ω, then the value of the emitter bypass capacitor will be
Option A:	10.6 µF
Option B:	1.06 µF
Option C:	10.6 mF
Option D:	10.6 F
3.	An amplifier has an open loop gain of 100, an input impedance of 1 kΩ. A feedback network with a feedback factor of 0.99 is connected to the amplifier in a voltage series feedback mode. The new input impedance with feedback is
Option A:	10 Ω
Option B:	100 Ω
Option C:	100 kΩ
Option D:	1 kΩ
4.	For a voltage shunt negative feedback amplifier
Option A:	Input impedance decreases but output impedance increases
Option B:	Both input impedance and output impedance increases
Option C:	Both input impedance and output impedance increases
Option D:	Cannot be predicted
5.	In an RC coupled amplifier, the voltage gain over mid-frequency range …….
Option A:	Changes abruptly with frequency
Option B:	Is constant
Option C:	Changes uniformly with frequency
Option D:	Cannot be predicted
6.	As per Barkhausean's condition, One condition for oscillation is …….
Option A:	A phase shift around the feedback loop of 180^{o}

Option B:	A gain around the feedback loop of one-third
Option C:	A phase shift around the feedback loop of 0^o
Option D:	A gain around the feedback loop of less than 1
7.	When a negative voltage feedback is applied to an amplifier, its bandwidth…….
Option A:	Is increased
Option B:	Is decreased
Option C:	Remains the same
Option D:	Cannot be predicted
8.	A 2-transistor class B power amplifier is commonly called …….. amplifier
Option A:	Dual
Option B:	Push pull
Option C:	Symmetrical
Option D:	Differential
9.	In designing of cascade amplifier if the overall voltage gain is 200 and the relation between the voltage gains of individual stages is A_{V1} = 0.7 A_{V2} then calculate the gains of the first stage and second stage respectively are
Option A:	13.8, 14.5
Option B:	16.9,11.83
Option C:	14.5,13.8
Option D:	11.83,16.9
10.	Class …….. operation gives the maximum distortion
Option A:	A
Option B:	B
Option C:	C
Option D:	AB
11.	Which of these are incorrect about the Darlington amplifier?
Option A:	It has a high input resistance
Option B:	The output resistance is low
Option C:	It has a unity voltage gain
Option D:	It is a current buffer
12.	In designing two stage RC coupled cascaded amplifiers, if the requirement of input impedance is greater than 1 MΩ and voltage gain requirement is more than 600 then which amplifier should be selected as the first stage amplifier?
Option A:	Common source JFET amplifier
Option B:	Common emitter BJT amplifier
Option C:	Common Base BJT amplifier
Option D:	Common gate JFET amplifier
13.	An n-channel MOSFET has I_{DSS} = 2mA, and V_P = - 4V. Its transconductance gm = (in mA/V) for an applied gate to source voltage V_{GS} = -2 V is
Option A:	0.25
Option B:	0.5
Option C:	0.75

Option D:	1
14.	The three amplifiers are connected in a multistage arrangement each with a voltage gain of 30dB. Compute for the overall voltage gain.
Option A:	90
Option B:	27000
Option C:	10
Option D:	30
15.	In an LC oscillator, the frequency of the oscillator is ……. L or C.
Option A:	Proportional to square of
Option B:	Directly proportional to
Option C:	Independent of the values of
Option D:	Inversely proportional to square root of
16.	When no signal is applied, the approximate collector efficiency of class A power amplifier is …….
Option A:	10%
Option B:	0%
Option C:	25%
Option D:	50%
17.	The output characteristics of a MOSFET, is a plot of
Option A:	Id as a function of Vgs with Vds as a parameter
Option B:	Id as a function of Vds with Vgs as a parameter
Option C:	Ig as a function of Vgs with Vds as a parameter
Option D:	Ig as a function of Vds with Vgs as a parameter
18.	What is the frequency of oscillation for an RC phase shift oscillator with R of 5 kΩ and C of 0.01 μF in each of its RC sections?
Option A:	3.18 kHz
Option B:	1.3 kHz
Option C:	3.18 Hz
Option D:	1.3 Hz
19.	For the operation of enhancement only n channel MOSFET, value of gate voltage has to be
Option A:	high positive
Option B:	high negative
Option C:	low positive
Option D:	zero
20.	When current feedback is applied to an amplifier its input impedance _____
Option A:	Is decreased
Option B:	Is increased
Option C:	Remains the same
Option D:	Cannot be predicted

Q2	**Solve any Two Questions out of Three**	

A	With the help of circuit diagram and ac equivalent model, derive the expression for input impedance, output impedance, voltage gain for a two stage CE-CE cascaded amplifier with bypassed emitter resistance.	10
B	Draw Wein Bridge using BJT and derive the frequency of oscillation for the same.	10
C	State and explain different types of biasing techniques for Depletion type MOSFET.	10
Q3	**Solve any Two questions out of three**	
A	Design the resistors of a 2 stage RC coupled CS-CS amplifier for the following parameters $A_V \geq 100$, I_{DQ}= 1.2 mA f_L = 20 Hz, V_O = 4 V. Assume gmo = 5 m℧, I_{DSS}= 7 mA, r_d= 50 kΩ, V_P= -4 V. Assume suitable V_{DD}	10
B	With the help of a neat block diagram, derive the expression for R_{IF}, R_{OF}, G_{mF} for voltage series negative feedback amplifier.	10
C	Draw circuit diagram of Class B Push Pull amplifier and explain its working. Find its maximum efficiency.	10

University of Mumbai
Examination June 2021
Examinations Commencing from 1st June 2021
Program: Electronics & Telecommunication
Curriculum Scheme: Rev2016
Examination: SE Semester IV
Course Code: ECC403 and Course Name: Linear Integrated Circuits
Time: 2-hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	An ideal op-amp requires infinite bandwidth because
Option A:	Signals can be amplified without attenuation
Option B:	Output common-mode noise voltage is zero
Option C:	Output voltage occurs simultaneously with input voltage changes
Option D:	Output can drive infinite number of devices
2.	With zero volts on both inputs, an op-amp ideally should have an output voltage
Option A:	equal to the positive supply voltage
Option B:	equal to the negative supply voltage
Option C:	equal to zero
Option D:	equal to CMRR
3.	The common-mode voltage gain for a practical op-amp is
Option A:	Smaller than differential-mode voltage gain
Option B:	Equal to differential-mode voltage gain
Option C:	Greater than differential-mode voltage gain
Option D:	Exactly twice the differential-mode voltage gain
4.	In a differential amplifier when inputs are applied to the base of both the transistors and the output is taken across the collectors of both the transistors the configuration is called as
Option A:	Single Input Balanced Output differential amplifier
Option B:	Single Input Unbalanced Output differential amplifier
Option C:	Dual Input Balanced Output differential amplifier
Option D:	Dual Input Unbalanced Output differential amplifier
5.	In the Phase shift oscillator, the frequency of oscillation and gain of the amplifier block are
Option A:	$f_o = 1 / (2\pi RC)$ and $\lvert A_V \rvert = 29$
Option B:	$f_o = 1 / (2\pi\ RC\ \sqrt{6})$ and $\lvert A_V \rvert = 29$
Option C:	$f_o = 1 / (2\pi\ RC\ \sqrt{6})$ and $\lvert A_V \rvert = 3$
Option D:	$f_o = 1 / (2\pi RC)$ and $\lvert A_V \rvert = 3$
6.	The input impedance of differentiator
Option A:	decreases when frequency increases
Option B:	decreases when frequency decreases
Option C:	is independent of frequency

Option D:	increases when frequency increases
7.	In an inverting ideal integrator, which component exhibits the feedback path connection?
Option A:	R
Option B:	C
Option C:	L
Option D:	Diode
8.	A Non inverting Comparator employs
Option A:	Only Negative feedback
Option B:	Only Positive feedback
Option C:	Both Negative and Positive feedback
Option D:	No feedback
9.	An integrator circuit
Option A:	uses a resistor in its feedback circuit.
Option B:	uses an inductor in its feedback circuit.
Option C:	uses a capacitor in its feedback circuit.
Option D:	uses a diode in its feedback circuit.
10.	The major function of the instrumentation amplifier is
Option A:	to convert analog signal to digital signal
Option B:	to amplify the low-level output signals of the transducers
Option C:	to attenuate the low-level output signals of the transducers
Option D:	to compare the input signals
11.	At what range the PLL can maintain the lock in the circuit?
Option A:	Lock in range
Option B:	Input range
Option C:	Feedback loop range
Option D:	Output Range
12.	The internal circuitry of the 555 timer consists of_____, an R-S flip-flop, a transistor switch.an output buffer amplifier, and a voltage divider.
Option A:	A comparator
Option B:	A Voltage Amplifier
Option C:	Two Comparators
Option D:	A peak detector
13.	An astable 555 timer has the_____ number of stable states.
Option A:	0
Option B:	1
Option C:	2
Option D:	3
14.	IC AD534 is a
Option A:	Voltage Controlled Oscillator
Option B:	Waveform generator
Option C:	Analog Multiplier

Option D:	Timer
15.	What is IC 723?
Option A:	Voltage regulator
Option B:	clipper
Option C:	clamper
Option D:	Precision rectifier
16.	In IC7805 the output voltage is
Option A:	5 V
Option B:	0 V
Option C:	8 V
Option D:	7 V
17.	If output voltage is 5V & output current is 50 mA it is
Option A:	Low Voltage Low Current Regulator
Option B:	Low Voltage High Current Regulator
Option C:	High Voltage Low Current Regulator
Option D:	High Voltage High Current Regulator
18.	In a dual slope ADC
Option A:	The input signal and the reference are integrated by two different integrators for a fixed interval of time
Option B:	The input signal is integrated for a fixed time and then the reference is integrated by the same integrator for a variable interval of time
Option C:	The input signal is integrated for a fixed time and then the reference is integrated by the same integrator for the same interval of time
Option D:	The input signal and the reference are integrated by two different integrators for variable intervals of time
19.	The output of a 4 bit DAC is exactly half of its full scale voltage when its input is
Option A:	1111
Option B:	0011
Option C:	1000
Option D:	1100
20.	If K is the scaling factor, Vfs is the full scale output voltage and b_0 (MSB) to b_2 (LSB) is the digital input to a Binary Weighted DAC. The output voltage equation for a 3-bit DAC converter is given by
Option A:	$V_o = K\ Vfs\ [(b_2/8) + (b_1/4) + (b_0/2)]$
Option B:	$V_o = K\ Vfs\ [(b_2) + (b_1/2) + (b_0/3)]$
Option C:	$V_o = K\ Vfs\ [(b_2) + (b_1) + (b_0)]$
Option D:	$V_o = K\ Vfs\ [(b_2/3) + (b_1/2) + (b_0)]$

Q2	**Solve any Two Questions out of Three (10 marks each)**
A	Design a second order Butterworth low pass filter for cut off frequency of 5 kHz.
B	Explain the working of R-2R type DAC with circuit diagram & Derive the output of equation of output voltage.
C	Design an astable multivibrator using IC 555 for frequency 5 kHz & duty cycle 66%. Assume C = 0.1μF.
Q3	**Solve any Two Questions out of Three (10 marks each)**
A	Design a voltage regulator using 723 to deliver an output voltage of 4 V and load current upto 40 mA.
B	With help of a neat circuit diagram and voltage transfer characteristics explain the working of an inverting Schmitt trigger.
C	Design a circuit to perform $Vo = 2V_2 - 3V_1$. Explain the working of the circuit.

University of Mumbai

Examination 2021 under cluster 5 (Lead College: APSIT)

Examinations Commencing from 1st June 2021 to 11th June 2021.

Program: EXTC

Curriculum Scheme: CBCS Rev2016

Examination: SE Semester IV

Course Code: ECC 404 and Course Name: Signals and Systems

Time: 2 hour Max. Marks: 80

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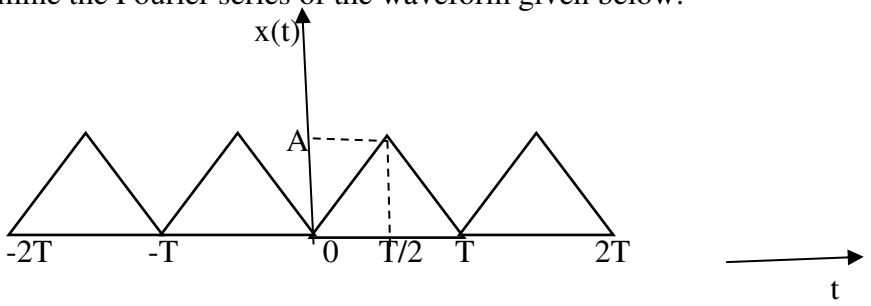
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The area under the curve $\int_{-\infty}^{\infty} \delta(t)dt$ is
Option A:	∞
Option B:	unity
Option C:	0
Option D:	undefined
2.	The discrete -time signal x(n) = $(-1)^n$ is periodic with fundamental period
Option A:	6
Option B:	4
Option C:	2
Option D:	0
3.	Given x(n) = $a^{\lvert n \rvert}$, $\lvert a \rvert < 1$ is
Option A:	An energy signal
Option B:	A power signal
Option C:	Neither an energy nor a power signal
Option D:	An energy as well as a power signal
4.	Which of the following is a causal system?
Option A:	y(t) = x(t^2)
Option B:	y(t) = x^2(t)
Option C:	y(t) = x(-t)
Option D:	y(t) = x(2t)
5.	The system described by y(n)=n x(n) is
Option A:	Linear, time-varying and stable
Option B:	Nonlinear, time-invariant and unstable
Option C:	Nonlinear, time-varying and stable
Option D:	Linear, time-varying and unstable
6.	Convolution is used to find
Option A:	The impulse response of an LTI system
Option B:	Frequency response of a system
Option C:	The time response of an LTI system
Option D:	The phase response of an LTI system

7.	The convolution of a rectangular pulse with itself results in a
Option A:	Rectangular pulse
Option B:	Square pulse
Option C:	Triangular pulse
Option D:	Sinc pulse
8.	The DTFS coefficients of a real and odd periodic signal are
Option A:	Real and odd
Option B:	Imaginary and even
Option C:	Real and even
Option D:	Imaginary and odd
9.	The Fourier transform of a signal $x(t) = e^{2t} u(-t)$ is given by
Option A:	$1 / (2-j\omega)$
Option B:	$2 / (1-j\omega)$
Option C:	$1 / (j2-\omega)$
Option D:	$2 / (j2-\omega)$
10.	The Fourier transform of a rectangular pulse is
Option A:	Another rectangular pulse
Option B:	Sinc function
Option C:	Triangular pulse
Option D:	Impulse function
11.	What is the Nyquist rate of the following signal? $x(t) = 3 \cos (50\pi t) + 10 \sin (300\pi t) – \cos (100\pi t)$
Option A:	50 Hz
Option B:	100 Hz
Option C:	200 Hz
Option D:	300 Hz
12.	Region of convergence of X(s) is bounded by
Option A:	Zeros
Option B:	Poles
Option C:	Poles and zeros
Option D:	No pole
13.	The Laplace transform of u(t) is
Option A:	1/s
Option B:	s
Option C:	$1/s^2$
Option D:	1
14.	_____ should lie on the left half of the s-plane for stability of a causal system.
Option A:	ROC
Option B:	Imaginary axis
Option C:	Zeros
Option D:	Poles
15.	Inverse Laplace transform of $(sI-A)^{-1}$ is called

Option A:	State equation in matrix form
Option B:	State transition matrix
Option C:	Transfer function
Option D:	Response of continuous time system.
16.	Find the Z-transform of $\delta(n)$.
Option A:	1
Option B:	z
Option C:	z^2
Option D:	z^3
17.	In state space modelling the number of state variables will decide____ of the system.
Option A:	Stability
Option B:	State
Option C:	Order
Option D:	Number
18.	The ROC of sequence x[n] = u[-n] is,
Option A:	$\|z\| > 1$
Option B:	$\|z\| < 1$
Option C:	No ROC
Option D:	$-1 < \|z\| < 1$
19.	The ROC of the signal $x[n]= a^n$ for $-5<n<5$
Option A:	Entire z-plane
Option B:	Entire z-plane except z=0 and z=∞
Option C:	Entire z-plane except z=0
Option D:	Entire z-plane except z=∞
20.	The Z-transform of $x[n]=[\sin \frac{\pi}{2}n]\ u[n]$
Option A:	$z/(z+1)$
Option B:	$z^2(z^2+1)$
Option C:	$1/(z+1)$
Option D:	$z/(z^2+1)$

Q2	**Solve any Four out of Six** **5 marks each**
A	Show that the response of an LTI system can be obtained by convolution of input and impulse response?
B	Determine whether the following signals are energy or power signals: (i) $x(t)=1.2 \sin(7\omega t)$ (ii) $x(t)=t\ u(t)$ (iii) $x[n]=(3/8)^n\ u[n]$ (iv) $x[n]=u[2n]$
C	What is the inverse Laplace transform of $X(s)=2/(s^2+2s+5)$?
D	What is BIBO stability? What is the condition to be satisfied for stability?
E	Find the time domain initial value x [0] and final value x [∞] of the z-

	domain function: $X(z)=z^2/((z-1)(z-0.2))$
F	The input x[n] and impulse response h[n] of an LTI system are given by x[n]= {-1,1,-2,-1,1,2} ↑ h[n]= {-0.5,0.5,-1,0.25,-1,-2} ↑ Find the response of the system using Linear Convolution.

Q3.	**Solve any Two Questions out of Three** **10 marks each**
A	Determine the Fourier series of the waveform given below: 
B	Determine the response of discrete time LTI system governed by the difference equation ***y(n)=-0.5y(n-1) + x(n),*** when the input is unit step and initial condition, a) ***y (-1) =0*** and b) ***y(-1)=1/3***
C	Find the inverse Laplace transform of X(s)=4/((s+2) (s+4)) if the ROC is, (i) -2> Re{s} >-4 (ii) Re{s} <-4 (iii) Re {s} > -2

University of Mumbai
Examination June 2021

Examinations Commencing from 1st June 2021

Program: **Electronics and Telecommunication**

Curriculum Scheme: Rev2016

Examination: SE Semester IV

Course Code: ECC405 and Course Name: Principles of Communication Engineering

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	What is the noise figure of an ideal receiver who introduces no noise on its own?
Option A:	0
Option B:	1
Option C:	Infinite
Option D:	10
2.	For a three stage cascade amplifier, calculate the overall noise figure when each stage has a gain of 12 dB and noise figure of 8dB.
Option A:	12
Option B:	24
Option C:	13.55
Option D:	8
3.	Which of the following processes is not done in the transmitter?
Option A:	Encoding
Option B:	Modulation
Option C:	decoding
Option D:	Mixing
4.	In DSB-SC amplitude modulation, bandwidth is ……. the audio signal frequency
Option A:	Twice
Option B:	Thrice
Option C:	Same as
Option D:	Four times
5.	An AM broadcast station transmits modulating frequencies up to 6 kHz. If the AM station is transmitting on a frequency of 594 kHz, the values of upper and lower sidebands and the total bandwidth occupied by the AM station are:
Option A:	300 KHz, 588 KHz, 12 KHz
Option B:	600 KHz, 400 KHz, 12 KHz
Option C:	400 KHz, 388 KHz, 12 KHz
Option D:	600 KHz, 588 KHz, 12 KHz
6.	In radio receivers, varactor diodes are used for ____ .
Option A:	Tuning

Option B:	Demodulation
Option C:	Mixing
Option D:	Amplification
7.	If the carrier power of an AM transmitter is 1000 W and it is modulated 100 percent, the AM power in each sideband is _____ W.
Option A:	1500
Option B:	1000
Option C:	500
Option D:	250
8.	What is the required bandwidth according to the Carson's rule, when a 100 MHz carrier is modulated with a sinusoidal signal at 2.5KHz, the maximum frequency deviation being 10 KHz.
Option A:	50 KHz
Option B:	25 MHz
Option C:	25 KHz
Option D:	5 MHz
9.	Armstrong method is used for the generation of
Option A:	Direct FM
Option B:	Indirect FM
Option C:	DSB-SC AM
Option D:	SSB
10.	What is the value of carrier frequency in the following equation for the FM signal? v(t)= 5 cos(6600t+ 12sin2500t)
Option A:	1050 Hz
Option B:	1150 Hz
Option C:	2000 Hz
Option D:	2110 Hz
11.	The ratio of actual frequency deviation to the maximum allowable frequency deviation is called
Option A:	Multi tone modulation
Option B:	Percentage modulation
Option C:	Phase deviation
Option D:	Modulation index
12.	Which component of the AM wave does not contain any information?
Option A:	Upper Sideband
Option B:	Lower Sideband
Option C:	Carrier
Option D:	Both sidebands
13.	"IF" stands for:
Option A:	indeterminate frequency
Option B:	image frequency
Option C:	intermodulation frequency
Option D:	intermediate frequency

14.	Which of the following is not a superheterodyne receiver stage?
Option A:	RF Stage
Option B:	IF Stage
Option C:	Modulator stage
Option D:	Mixer
15.	The ability of a receiver to reject unwanted signals is called as ____ .
Option A:	Sensitivity
Option B:	Gain
Option C:	Selectivity
Option D:	Ripple factor
16.	For what value of Sampling Frequency does the sampling of the following signal $x(t) = 5 \cos 100\pi t$ will not generate aliasing error?
Option A:	40 Hz
Option B:	120 Hz
Option C:	30 Hz
Option D:	45 Hz
17.	The PPM can be obtained from
Option A:	PAM
Option B:	PWM
Option C:	DM
Option D:	PCM
18.	In pulse width modulation,
Option A:	Amplitude of the carrier pulse is varied
Option B:	Synchronization is not required between transmitter and receiver
Option C:	Instantaneous power at the transmitter is constant
Option D:	Frequency of the carrier pulse is varied
19.	In multiplexing, channels are separated by unused strips of bandwidth guard bands - to prevent
Option A:	Overlapping
Option B:	Synchronization
Option C:	modulation
Option D:	bandwidth
20.	To combine the multiple signals in FDM the circuit required to be used is
Option A:	Oscillator
Option B:	Linear Mixer
Option C:	Non Linear Mixer
Option D:	Filter

Q2 **(20 Marks)**	**Solve any Two Questions out of Three** **10 marks each**
A	Draw the transmitter and receiver of TDM signal. Explain the working in detail.
B	For an AM DSBFC modulator with a carrier frequency 100 KHz and a maximum modulating signal frequency 5 kHz determine i) Frequency limits for the upper and lower sidebands ii) Bandwidth ii) USF and LSF when modulating signal frequency is a single frequency 5KHz tone iv) Sketch the output spectrum.
C	State and prove sampling theorem in detail for low pass bandlimited signal

Q3 **(20 Marks Each)**	**Solve any Two Questions out of Three** **10 marks each**
A	Explain the low level and high level modulation.
B	Compare all the types of AM. Explain the application of VSB
C	What are the disadvantages of TRF receivers? Explain the working of superheterodyne receivers.

University of Mumbai

Examination 2021 under cluster __ (Lead College: _____)

Examinations Commencing from 1st June 2021 to 10th June 2021

Program: **BE Electronics and Telecommunication Engineering**

Curriculum Scheme: Rev 2019 'C' Scheme

Examination: SE Semester IV

Course Code: **ECC401** and Course Name: **Engineering Mathematics IV**

Time: 2 hour Max. Marks: 80

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Note : Q1 carrying 40 marks. Q2 and Q3 are carrying 20 equal marks.

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks. 2 marks each**
1.	If x is a discrete random variable with the following probability distribution x | 1 | 2 | 3 P(x) | a | 2a | a Find P(X≤ 2).
Option A:	$\frac{1}{4}$
Option B:	$\frac{1}{2}$
Option C:	$\frac{3}{4}$
Option D:	1
2.	Find E(X) if X has the p.d.f f(x) = $\begin{cases} \frac{3}{4}(2x - x^2) & ,0 \le x \le 2 \\ 0 & ,otherwise \end{cases}$
Option A:	$\frac{3}{2}$
Option B:	1
Option C:	2
Option D:	$\frac{1}{2}$
3.	If X and Y are independent random variables with means 2,3 and variance 1,2 respectively, find the mean and variance of the random variable Z = 2X - 5Y
Option A:	-11 , 54
Option B:	19 , 54
Option C:	19 , -8
Option D:	-11, -8
4.	Suppose the number of accidents occurring weekly on a particular stretch of a highway follow a Poisson distribution with mean **3** .Calculate the probability that there is at least one accident this week.
Option A:	0.6 347
Option B:	0.9502

Option C:	0.7275
Option D:	0.8002
5.	The following results were obtained from records of age (x) and systolic blood pressure (y) of a group of 10 men: <table><tr><td></td><td>x</td><td>y</td></tr><tr><td>mean</td><td>53</td><td>142</td></tr><tr><td>variance</td><td>130</td><td>165</td></tr></table> Correlation coefficient = 0.8 Estimate the blood pressure of a man whose age is 45?
Option A:	134.78
Option B:	130.56
Option C:	129.56
Option D:	137.56
6.	A coefficient of correlation is computed to be -0.95 means that
Option A:	The relationship between the two variables is weak
Option B:	The relationship between the two variables is strong and positive.
Option C:	The relationship between the two variables is strong but negative.
Option D:	The correlation coefficient cannot have this value.
7.	If the tangent of the angle made by the line of regression of y on x is 0.6 and $\sigma_x = \frac{1}{2}\sigma_y$ Find the correlation coefficient between x and y.
Option A:	$-$ 2 .5
Option B:	0. 25
Option C:	$-$ 0. 3
Option D:	0. 3
8.	Evaluate $\int_c \frac{7z-1}{(z-3)(z+5)} dz$, where c is the circle $\|z\|$ =1.
Option A:	$2\pi i$
Option B:	0
Option C:	6 πi
Option D:	πi
9.	Find the residue of $f(z) = \frac{z^2}{(z+2)(z-1)^2}$ at z = -2
Option A:	1/9
Option B:	5/9
Option C:	1/3
Option D:	4/9
10.	Identify the type of singularity of the function $f(z) = \frac{sinhz}{z^7}$
Option A:	z = 0 is a pole of order 7 for the given function
Option B:	z = 0 is a pole of order 6 for the given function
Option C:	z = 0 is an essential singularity

Option D:	z = 0 is a pole of order 3 for the given function
11.	Evaluate $\int_C \frac{e^z}{z-1}dz$ where C where c is the circle $\|z\|$ =2.
Option A:	$2\pi i$
Option B:	$2\pi ie^2$
Option C:	$2\pi i$e
Option D:	πie^2
12.	Find the value of the integral $\int_0^{1+i}(x^2 - iy)dz$ along the path y = x
Option A:	$\frac{5-i}{6}$
Option B:	$\frac{5+i}{6}$
Option C:	$\frac{1+5i}{6}$
Option D:	$\frac{1-5i}{6}$
13.	Find the vector orthogonal to (2,1,−2) and (1,2,2)
Option A:	(1,−2, 1)
Option B:	(2, −2, 1)
Option C:	(1, −1, 1)
Option D:	(2 , 2, −1)
14.	If u = (3, 1, 4, −2) v = (2 , 2, 0,1) then find $\langle u, v\rangle$ and $\|\|u\|\|$,$\|\|v\|\|$
Option A:	-6 , $\sqrt{30}$, $\sqrt{10}$
Option B:	5 , $\sqrt{2}$, $\sqrt{6}$
Option C:	5 , $\sqrt{30}$, 3
Option D:	6 , $\sqrt{30}$, 3
15	Determine which of the following are subspaces of R^3 W_1={$(a, 0, b), a, b \in R$} W_2={$(a, b, 1), a, b \in R$}
Option A:	$W_1 and\ W_2$ are the subspaces of R^3
Option B:	W_1 and W_2 *are* not the subspaces of R^3
Option C:	$W_1 is\ a\ subapace\ of\ R^3$ but W_2 *is* not a subspace of R^3
Option D:	$W_1 is\ not\ a\ subapace\ of\ R^3$ but W_2 *is* a subspace of R^3
16.	Write down the matrix of the quadratic form $x_1{}^2 + 2x_2{}^2 - 7x_3{}^2 - 4x_1x_2 + 6x_2x_3 + 8x_3x_1$
Option A:	$\begin{bmatrix} 1 & -2 & 4 \\ -2 & 2 & 3 \\ 4 & 3 & -7 \end{bmatrix}$
Option B:	$\begin{bmatrix} 1 & -4 & 8 \\ -4 & 2 & 6 \\ 8 & 6 & -7 \end{bmatrix}$

Option C:	$\begin{bmatrix} 1 & 2 & 4 \\ 2 & 2 & 3 \\ 4 & 3 & -7 \end{bmatrix}$
Option D:	$\begin{bmatrix} 1 & 4 & 8 \\ 4 & 2 & 6 \\ 8 & 6 & 7 \end{bmatrix}$
17.	Find the rank , signature, index of the transformed quadratic form $3{y_1}^2 + \frac{2}{3}{y_2}^2 - \frac{39}{2}{y_3}^2$.
Option A:	rank = 3, signature =2, index =1
Option B:	rank = 3, signature =1, index =2.
Option C:	rank = 2, signature =3, index =1.
Option D:	rank = 2, signatur e=1, index =3.
18.	A necessary condition for I = $\int_{x_1}^{x_2} f(x, y, y^{\mid}, y^{\mid\mid})dx$ to be an extremal is that
Option A:	$\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y^{\mid}}\right) + \frac{d^2}{dx^2}\left(\frac{\partial f}{\partial y^{\mid\mid}}\right) = 0$
Option B:	$\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y^{\mid}}\right) = 0$
Option C:	$\frac{\partial f}{\partial y} + \frac{d}{dx}\left(\frac{\partial f}{\partial y^{\mid}}\right) = 0$
Option D:	$\frac{\partial f}{\partial y} + \frac{d}{dx}\left(\frac{\partial f}{\partial y^{\mid}}\right) + \frac{d^2}{dx^2}\left(\frac{\partial f}{\partial y^{\mid\mid}}\right) = 0$
19.	The functional I=$\int_a^b (y^{\mid^2} + 12xy)dx$ has the following extremal with c_1 and c_2 as arbitrary constants.
Option A:	$c_1x^3 + c_2x$
Option B:	$x^2 + c_1x + c_2$
Option C:	$c_1x + c_2$
Option D:	$x^3 + c_1x + c_2$
20.	The extremal of the functional I=$\int_a^b (16y^2 - y^{\mid\mid^2} + x^2)dx$ is
Option A:	y = $c_1 cos2x + c_2 sin2x$
Option B:	y = $c_1e^{2x} + c_2e^{-2x}$
Option C:	y = $c_1e^{2x} + c_2e^{-2x} + c_3 cos2x + c_4 sin2x$
Option D:	y = $c_1e^{x} + c_2e^{-x} + c_3 cosx + c_4 sinx$

Q2. (20 Marks)	**Solve any Four out of Six.** **5 marks each**
A	Fit a Poisson distribution for the following distribution . x: 0, 1, 2, 3, 4, Total f: 43, 40, 25, 10, 2, 120
B	Obtain the rank correlation coefficient for the following data X: 68, 64, 75, 50, 64, 80, 75, 40, 55, 64 Y: 62, 58, 68, 45, 81, 60, 68, 48, 50, 70
C	Obtain two distinct Laurent's series of $f(z) = \frac{2z-3}{z^2-4z+3}$ about z = 4 indicating the region of convergence
D	Construct an orthonormal basis of R^3 $using$ Gram-Schmidt process to S = $\{(1,0,0), (3,7,-2), (0,4,1)\}$
E	Reduce the symmetric matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ to the diagonal form using congruent transformation and interpret the result in terms of quadratic forms
F	Find the curve on which the functional $\int_a^b \sqrt{1+y'^2}\,dx$ is extremum.

Q3. (20 Marks)	**Solve any Four out of Six.** **5 marks each**
A	In a sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5 Assuming the distribution to be normal ,find (i)how many students score between 12 and 15 ? (ii) how many score above 18? (iii) how many score below 8?
B	In a partially destroyed laboratory, record of an analysis of correlation data, the following results only are legible: σ_x =3. Regression equations: 8X−10Y = −66, 40X−18Y=214. What are: (i) the mean values X and Y, (ii) the correlation coefficient between X and Y, (iii) the standard deviation of Y
C	Evaluate $\oint_C \frac{sin\pi z^2 + cos\pi z^2}{(z-2)(z-3)} dz$ where C is the circle $\|z\|$ =4..
D	Let V be a set of positive real numbers with addition and scalar multiplication defined as $x + y = xy$ and $cx = x^c$ .Show that Vis a vector space under this addition and scalar multiplication.
E	Reduce the following quadratic form into canonical form. Q: $x_1{}^2 + 2x_2{}^2 + 3x_3{}^2 - 2x_1x_3 + 2x_2x_3 + 2x_2x_1$
F	Using Rayleigh -Ritz method , solve the boundary value problem I=$\int_0^1 (y'^2 - y^2 - 2xy)dx$ with y(0)=0 and y(1)=0.

University of Mumbai
Examination June 2021

Examinations Commencing from 1st June 2021

Program: BE Electronics and Telecommunication

Curriculum Scheme: Rev2019 C-Scheme

Examination: SE Semester IV

Course Code: ECC402 and Course Name: Microcontrollers

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which of the following parts of the microprocessor is closely related to register?
Option A:	Processor
Option B:	ALU
Option C:	CPU
Option D:	Memory
2.	During the execution of a program, which register is initialized first?
Option A:	Instruction registers
Option B:	Program Counter
Option C:	Stack pointer
Option D:	Program status word
3.	A microprocessor is clocked at a rate of 3 GHz. How long is a clock cycle?
Option A:	0.2ns
Option B:	0.3n
Option C:	1.5ns
Option D:	1ns
4.	How can we change the speed of a DC motor using PWM in PIC 16F886 microcontroller?
Option A:	By changing amplitude of Pulse
Option B:	By keeping fixed duty cycle
Option C:	By changing duty cycle
Option D:	By increasing power of Pulse
5.	A CPU generates 32-bit virtual addresses. The page size is 4 KB. The processor has a translation look-aside buffer (TLB), which can hold a total of 128 page table entries and is 4-way set associative. The minimum size of the TLB tag is:
Option A:	11 bits
Option B:	13 bits
Option C:	15 bits
Option D:	20 bits
6.	The high speed memory between the CPU and main memory is called as-------
Option A:	Cache Memory
Option B:	Virtual memory
Option C:	Secondary memory
Option D:	Storage memory

7.	The register that can be used as a scratch pad in 8051 is
Option A:	Accumulator
Option B:	Stack Pointer
Option C:	Program Counter
Option D:	B register
8.	The registers that provide control and status information about Timer/Counters in 8051 is
Option A:	IP, IE
Option B:	TMOD, TCON
Option C:	SCON,SBUF
Option D:	Flag register, Accumulator
9.	The higher and lower bytes of a 16-bit register DPTR in 8051 are represented respectively as
Option A:	LDPTR and HDPTR
Option B:	DPTRL and DPTRH
Option C:	DPH and DPL
Option D:	HDP and LDP
10.	The pin that is grounded for interfacing external program memory in 8051 is
Option A:	EA(active low)
Option B:	PSEN(active low)
Option C:	OE(active low)
Option D:	ALE
11.	The 8051 instruction that is used to complement or invert the bit of a bit addressable SFR is
Option A:	CLR C
Option B:	CPL C
Option C:	CPL Bit
Option D:	ANL Bit
12.	The first byte of an absolute jump instruction in 8051 consists of
Option A:	3 LSBs of opcode and 5 MSBs of 11-bit address
Option B:	5 LSBs of opcode and 3 MSBs of 11-bit address
Option C:	5 MSBs of opcode and 3 LSBs of 11-bit address
Option D:	6 MSBs of opcode and 1 LSB of 11-bit address
13.	What is the function of a watchdog timer (WDT)?
Option A:	It resets the system if applied voltage increased above threshold value
Option B:	It resets the system if applied voltage decreases below threshold value
Option C:	It resets the system if the software fails to operate properly.
Option D:	It resets the system if Power failure is detected.
14.	The instructions that change the sequence of execution are
Option A:	conditional instructions
Option B:	logical instructions
Option C:	control transfer instructions

Option D:	data transfer instructions
15.	In the instruction “MOV TH1, #-3”, what is the value that is being loaded in the TH1 register?
Option A:	0xFCH
Option B:	0xFBH
Option C:	0xFDH
Option D:	0xFEH
16.	How many registers are there in ARM7?
Option A:	35 register(28 GPR and 7 SPR)
Option B:	37 registers(28 GPR and 9 SPR)
Option C:	37 registers(31 GPR and 6 SPR)
Option D:	35 register(30 GPR and 5 SPR)
17.	How much flash memory does the Atmega328 have?
Option A:	13K bytes
Option B:	32K bytes
Option C:	256K bytes
Option D:	16K bytes
18.	What is the capability of ARM7 instruction for a second?
Option A:	110 MIPS
Option B:	130 MIPS
Option C:	150 MIPS
Option D:	125 MIPS
19.	Which of the following are pipelining stages of ARM7?
Option A:	Fetch, Decode, Write
Option B:	Fetch, Decode, Execute, Write
Option C:	Fetch, Execute, Write
Option D:	Fetch, Decode, Execute
20.	In ARM 7, program counter is implemented using _____
Option A:	Caches
Option B:	Heaps
Option C:	General purpose register
Option D:	Stack

Q2 **(20 Marks)**	**Solve any Four out of Six** **5 marks each**
A	Compare RISC and CISC architecture.
B	Compare microprocessor and microcontroller.
C	Explain the concept of cache memory with a diagram.
D	Explain the concept of assembler directives in 8051.
E	Explain the concept of architectural inheritance in ARM 7.
F	Explain the concept of Cortex-A, Cortex-R and Cortex-M in ARM 7.

Q3. **(20 Marks)**	**Solve any Two Questions out of Three** **10 marks each**
A	Write an assembly level language program using 8051 to produce a delay time of 15 seconds if crystal frequency is 11.0592MHz. Use Timer 0 in mode 1.
B	Explain in detail the various steps involved in selecting a microcontroller for a given application.
C	Explain in detail with diagrams Ports Pin Structure of 8051 microcontroller.

University of Mumbai

Examination June 2021

Examinations Commencing from 1st June 2021

Program: Electronics & Telecommunication

Curriculum Scheme: R2019

Examination: SE Semester IV

Course Code: ECC 403 and Course Name: Linear Integrated Circuit

Time: 2 hours Max. Marks: 80

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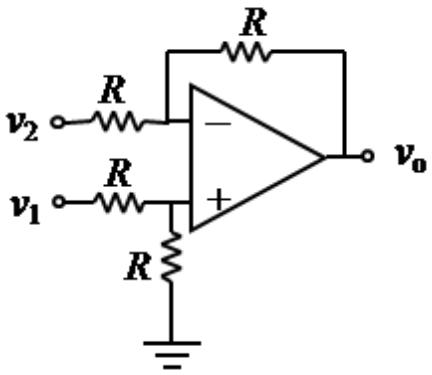
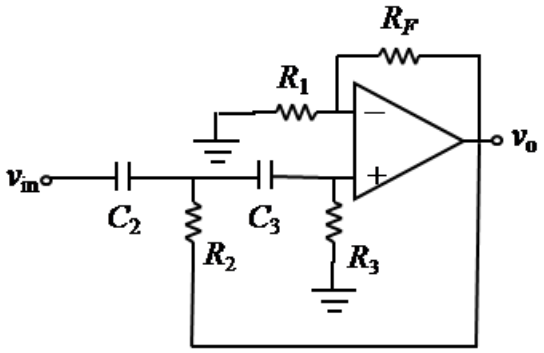
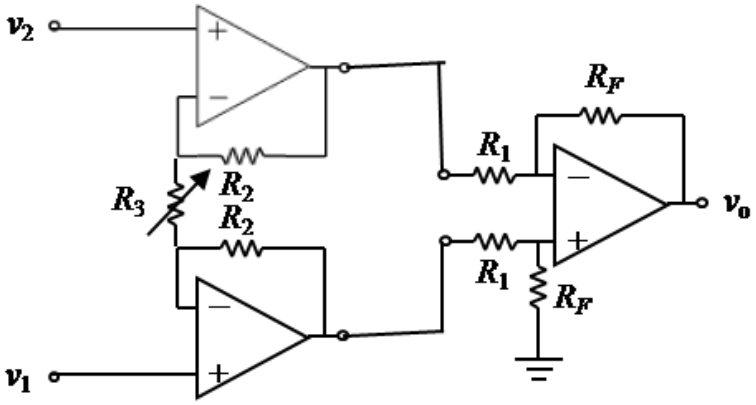
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	An ideal op-amp requires infinite bandwidth because
Option A:	Signals can be amplified without attenuation
Option B:	Output common-mode noise voltage is zero
Option C:	Output voltage occurs simultaneously with input voltage changes
Option D:	Output can drive infinite number of devices
2.	In an inverting amplifier using op-amp
Option A:	The input is connected to the non-inverting terminal via resistor and inverting terminal is kept floating
Option B:	The input is connected to the non-inverting terminal via resistor and inverting terminal is grounded
Option C:	The input is connected to the inverting terminal via resistor and non- inverting terminal is kept floating
Option D:	The input is connected to the inverting terminal via resistor and non- inverting terminal is grounded
3.	**For the difference amplifier shown below, the output voltage is given by** 
Option A:	$v_o = v_1 + v_2$
Option B:	$v_o = v_1 - v_2$
Option C:	$v_o = -v_1 + v_2$
Option D:	$v_o = -(v_1 + v_2)$

4.	**A current to voltage converter converts**
Option A:	**Input current to proportional output voltage.**
Option B:	**Input current to proportional output current.**
Option C:	**Input voltage to proportional output voltage.**
Option D:	**Input voltage to proportional output current.**
5.	**The filter shown below has R_1 = 27 kΩ, R_F = 15.8 kΩ, R_2 = R_3 = 33 kΩ, C_2 = C_3 = 0.0047 µF is a** 
Option A:	High Pass filter with cut off frequency ≈ 1 kHz
Option B:	High Pass filter with cut off frequency ≈ 10 kHz
Option C:	Low Pass filter with cut off frequency ≈ 1 kHz
Option D:	Low Pass filter with cut off frequency ≈ 10 kHz
6.	For a Wein Bridge oscillator, the RC networks in the feedback circuit have values of their resistances R = 3.3 kΩ and capacitances C = 0.047 µF,
Option A:	Its frequency of oscillation is ≈ 1 kHz
Option B:	Its frequency of oscillation is ≈ 3.030 kHz
Option C:	Its frequency of oscillation is ≈ 3.3 kHz
Option D:	Its frequency of oscillation is ≈ 480 Hz
7.	For a non inverting comparator, input signal and reference voltage are given to
Option A:	inverting terminal of the op-amp through separate resistors
Option B:	non-inverting terminal of the op-amp through separate resistors
Option C:	inverting terminal and non-inverting terminal of the op-amp respectively
Option D:	non-inverting terminal and inverting terminal of the op-amp respectively
8.	An Inverting Schmitt trigger employs
Option A:	Only Negative feedback
Option B:	Only Positive feedback
Option C:	Both Negative and Positive feedback
Option D:	No feedback
9.	A square waveform having ON time greater than its OFF time is fed as input to an integrator. The resulting output of the integrator is called
Option A:	Triangular waveform
Option B:	Sawtooth waveform
Option C:	Inverted Square waveform
Option D:	Sine waveform

10.	The reference voltage of upper comparator used in functional block diagram of IC 555 is
Option A:	1/5 V_{CC}
Option B:	1/3 V_{CC}
Option C:	2/3 V_{CC}
Option D:	2/5 V_{CC}
11.	The output pulse width of a monostable multivibrator using 555 where R and C are the external components is
Option A:	RC
Option B:	1.1 RC
Option C:	(2/3) RC
Option D:	(1/3) RC
12.	In an Astable multivibrator if R_A=25KΩ, R_B=33kΩ, C=0.5µF, calculate discharging time of capacitor waveform
Option A:	11.43 ms
Option B:	20 ms
Option C:	12.5 ms
Option D:	10 ms
13.	In IC7805 the output voltage is
Option A:	5 V
Option B:	0 V
Option C:	8 V
Option D:	7 V
14.	For High voltage, High current voltage regulator using IC 723, output voltage and output currents respectively have one of the following correct values.
Option A:	Less than 7 V, greater than 150 mA
Option B:	Less than 7 V, less than 150 mA
Option C:	7 to 37 V, greater than 150 mA
Option D:	7 to 37 V, less than 150 mA
15.	Output voltage of LM317 can be adjusted from
Option A:	-1.2 V to 37 V
Option B:	-1.2 V to -37 V
Option C:	1.2 V to 37 V
Option D:	1.2 V to -37 V
16.	Which one of these ICs is a Voltage Controlled Oscillator?
Option A:	IC 565
Option B:	IC 566
Option C:	IC 555
Option D:	IC 723
17.	For a Phase Locked Loop which of the following is true?
Option A:	Lock in range > Capture range
Option B:	Lock in range < Capture range

Option C:	Lock in range = Capture range
Option D:	Lock in range = half of Capture range
18.	An integrator circuit
Option A:	uses a resistor in its feedback circuit.
Option B:	uses an inductor in its feedback circuit.
Option C:	uses a capacitor in its feedback circuit.
Option D:	uses a diode in its feedback circuit.
19.	**The instrumentation amplifier shown in diagram has $R_1 = R_F = 25\ k\Omega$, $R_2 = 10\ k\Omega$, and R_3 varying from 100 Ω to 1 kΩ, the voltage gain of the amplifier varies from** 
Option A:	**10 to 100**
Option B:	**21 to 201**
Option C:	**1 to 101**
Option D:	**2 to 202**
20.	Which of these circuits clips one half cycle of a sinusoidal waveform?
Option A:	Comparator
Option B:	Schmitt Trigger
Option C:	Half Wave Precision Rectifier
Option D:	Peak detector

Q2	**Solve any Two Questions out of Three (10 marks each)**
A	Design a second order low pass Butterworth filter for cut off frequency of 10 kHz.
B	With the help of a functional block diagram explain the working of PLL IC 565.
C	Design an astable multivibrator using IC 555 for frequency 1 kHz & duty cycle 50%. Assume C = 0.1μF.
Q3	**Solve any Two Questions out of Three (10 marks each)**
A	Design a voltage regulator using 723 to deliver an output voltage of 15 V and load current upto 50 mA.
B	With help of a neat circuit diagram and voltage transfer characteristics explain

	the working of a non- inverting Schmitt trigger.
C	Design a circuit to perform Vo = $3V_2$ - $6V_1$. Explain the working of the circuit.

University of Mumbai

Examination 2021 under cluster 5 (Lead College: APSIT)

Examinations Commencing from 1st June 2021 to 11th June 2021.

Program: Electronics and Telecommunication Engineering

Curriculum Scheme: Rev2019

Examination: SE Semester IV

Course Code: ECC 404 and Course Name: Signals and Systems

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which of the following responses of an LTI system does not depend on initial conditions?
Option A:	Natural response
Option B:	free response
Option C:	forced response
Option D:	total response
2.	Which of the following is an energy signal?
Option A:	$x(t)=A\ e^{j\Omega t}$
Option B:	$x(t)=A \sin \Omega t$
Option C:	$x(t)=B \cos \Omega t$
Option D:	$x(t)=e^{-at}\ u(t)$
3.	The Fourier transform of a function is equal to its two-sided Laplace transform evaluated ____
Option A:	On the real axis of the s-plane
Option B:	On the line parallel to the real axis of the s-plane
Option C:	On the imaginary axis of the s-plane
Option D:	On the line parallel to the imaginary axis of the s-plane
4.	The Fourier transform of a $x(t)= e^{7t}\ u(-t)$ function is given as:
Option A:	$F(j\omega) = 1/(7+j\omega)$
Option B:	$F(j\omega) = 7/(1+j\omega)$
Option C:	$F(j\omega) = 7/(1-j\omega)$
Option D:	$F(j\omega) = 1/(7-j\omega)$
5.	Find the Z-transform of $\delta(n+3)$.
Option A:	1
Option B:	z
Option C:	z^2
Option D:	z^3
6.	Find the Z-transform of u(-n).
Option A:	1/(1-z)
Option B:	1/(1+z)
Option C:	z/(1-z)
Option D:	z/(1+z)

7.	For what kind of signals one sided z-transform is unique?
Option A:	All signals
Option B:	Anti-causal signal
Option C:	Causal signal
Option D:	Non-causal
8.	What is the one-sided z-transform of x(n)=δ(n-k)?
Option A:	0
Option B:	1
Option C:	z^{-k}
Option D:	z^{k}
9.	Linear convolution between two sequences $x_1(n) = \{\underset{\uparrow}{-1}, 1, 2, -2\}$ and $x_2(n) = \{0.5, \underset{\uparrow}{1}, -1, 2, 0.75\}$ is
Option A:	$\{-0.3, \underset{\uparrow}{-0.6}, 3, -2, -2.75, 6.75, -2.5, -1.6\}$
Option B:	$\{-0.1, \underset{\uparrow}{-0.5}, 3, -4, -2.75, 9.75, -2.5, -1.5\}$
Option C:	$\{-0.5, \underset{\uparrow}{-0.5}, 3, -2, -2.75, 6.75, -2.5, -1.5\}$
Option D:	$\{-0.5, \underset{\uparrow}{-0.4}, 1, -2, -2.75, 6.75, -2.5, -1.5\}$
10.	Find the final value, x(∞) in time domain for the s-domain signal $X(s)=s/(s^2+4)$.
Option A:	0
Option B:	1
Option C:	0.25
Option D:	1.25
11.	The convolution of u(n) with u(n-4) at n=5 is
Option A:	5
Option B:	2
Option C:	1
Option D:	0
12.	The samples of a cosine wave at zero frequency are equivalent to samples of
Option A:	Sine wave
Option B:	A DC signal
Option C:	A cosine wave
Option D:	An unknown signal
13.	Determine whether the signal, $x(t)=3\cos\sqrt{2}\,t + 7\cos 5\pi t$ is periodic or not
Option A:	Non-Periodic
Option B:	Periodic
Option C:	Rational
Option D:	Irrational

14.	If input to a system is not bounded , then system is
Option A:	stable
Option B:	Unstable
Option C:	Cannot be tested
Option D:	ideal
15.	Which one of the following systems is causal?
Option A:	$y(t)=x(t)+x(t-3)+x(t^2)$
Option B:	$y(n)=x(n+2)$
Option C:	$y(t)=x(t-1)+x(t-2)$
Option D:	$y(n)=x(2n^2)$
16.	Find the Nyquist rate and Nyquist interval for the signal $f(t)=(\sin 500\pi t) / \pi t$.
Option A:	500 Hz, 2 sec
Option B:	500 Hz, 2 msec
Option C:	2 Hz, 500 sec
Option D:	2 Hz, 500 msec
17.	The impulse response h (t) of an LTI system is given by e^{-2t} u(t). What is the step response?
Option A:	$y(t) = \frac{1}{2} (1 - e^{-2t}) u(t)$
Option B:	$y(t) = \frac{1}{2} (1 - e^{-2t})$
Option C:	$y(t) = (1- e^{-2t}) u(t)$
Option D:	$y(t) = \frac{1}{2} (e^{-2t}) u(t)$
18.	Fourier transform is evaluation of Laplace transform along the _____ axis in s-plane.
Option A:	Real
Option B:	Imaginary
Option C:	Z domain
Option D:	S domain
19.	Determine the convolution of $x_1(t)= e^{-2t} u(t)$ and $x_2(t)=e^{-6t} u(t)$, using Fourier Transform?
Option A:	$0.25(e^{-2t} – e^{-6t}) u(t)$
Option B:	$0.15(e^{-2t} – e^{-6t}) u(t)$
Option C:	$0.25(e^{-3t} – e^{-6t}) u(t)$
Option D:	$0.35(e^{-2t} – e^{-5t}) u(t)$
20.	In IIR systems, the _____ structure will give direct relation between time domain and z domain.
Option A:	Direct form-I
Option B:	Direct form
Option C:	Linear phase
Option D:	Direct form-II

Q2	**Solve any Four out of Six** **5 marks each**
A	State and prove any two properties of Fourier Transform.
B	Determine the following systems are memory less, causal, linear or Time invariant $y(t)=5x(t)+2$
C	Using Laplace Transform, determine the natural response of the system represented by the following equations. $(d^2y(t)/dt^2) + 10\,(dy(t)/dt) + 21\,y(t) = 8\,x(t)$, $y(0)=2$, $(dy(t)/dt) = -3$ at $t=0$
D	Explain in brief the ROC conditions in Laplace Transform.
E	Determine the autocorrelation of the CT signal given by $x(t)=A\ rect\ (t/2)$.
F	The Impulse response of DT system is given by $h[n]= \{1,2,3\}$ and the output response is given by $y[n]= \{1,1,2,-1,3\}$, Using Z-Transform, determine x[n] by long division method.

Q3. **(20 Marks Each)**	**Solve any Two Questions out of Three** **10 marks each**
A	Consider a causal LTI system with $H(j\omega) = (j\omega+2)^{-1}$. For a particular input $x(t)$, this system produces output $y(t)=e^{-2t}\,u(t)-e^{-3t}\,u(t)$. Find out $x(t)$ using Fourier Transform.
B	A LTI system has the following transfer function $$H(z) = \frac{z}{(z-\frac{1}{4})(z+\frac{1}{4})(z-\frac{1}{2})}$$ Give all possible ROC condition a) Show pole-zero diagrams b) Find impulse response of system c) Comment on the system stability and causality for all possible ROC's
C	Obtain Inverse Laplace Transform of the function $X(s)=(3s+7)/(s^2-s-12)$ for following ROCs, also comment on the stability and causality of the systems for each of the ROC conditions. Support your answer with appropriate sketches of ROCs. i. $Rs(s)>4$ ii. $Re(s)<-3$

University of Mumbai
Examination June 2021

Examinations Commencing from 1st June 2021

Program: **Electronics and Telecommunication**

Curriculum Scheme: Rev2019

Examination: SE Semester IV

Course Code: ECC4405 and Course Name: Principles of Communication Engineering

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which of the following steps is not included in the process of reception?
Option A:	Decoding
Option B:	Encoding
Option C:	Storage
Option D:	Interpretation
2.	A receiver has a noise figure of 2.04dB. What is the equivalent noise temperature of that receiver?
Option A:	154K
Option B:	200K
Option C:	174K
Option D:	300K
3.	Ionospheric propagation is also called as------
Option A:	Sea wave propagation
Option B:	Ground wave propagation
Option C:	Sky wave propagation
Option D:	Line of sight propagation
4.	A 400W carrier is modulated to a depth of 75%. Calculate the total power in the modulated wave.
Option A:	512.5W
Option B:	400 W
Option C:	200 W
Option D:	612 W
5.	The Vmax p-p value of an AM signal as observed on DSO as 5.9 divisions and the Vmin p-p is observed as 1.2 divisions. Calculate the modulation index
Option A:	1
Option B:	0.3
Option C:	0.8
Option D:	0.662
6.	The primary benefit of SSB AM is
Option A:	Reduction in the power consumption
Option B:	Reduction in the bandwidth requirement

Option C:	Simple circuit
Option D:	Less costly
7.	The balanced modulator produces which frequencies at its output
Option A:	Carrier frequency
Option B:	Modulating signal frequency
Option C:	Sum and difference of modulating and carrier frequencies
Option D:	Product of modulating and carrier frequencies
8.	The time constant of R & C in diode detector is chosen to be ------ compared to the period of carrier signal
Option A:	Long
Option B:	Short
Option C:	Equal
Option D:	Double
9.	Vestigial sideband modulation is normally used for
Option A:	HF point-to-point communications
Option B:	Satellite broadcasting
Option C:	TV broadcasting
Option D:	stereo broadcasting
10.	The ratio of frequency deviation and modulating signal frequency is called as
Option A:	Deviation ratio
Option B:	Frequency ratio
Option C:	Modulation index
Option D:	Modulation ratio
11.	What is the maximum bandwidth of an FM signal with a deviation of 30 kHz and a maximum modulating signal of 5 kHz using Carson's rule?
Option A:	70 KHz
Option B:	35 KHz
Option C:	80KHz
Option D:	40 KHz
12.	Which of the following is not a disadvantage of FM over AM?
Option A:	Wide bandwidth
Option B:	Complex circuit
Option C:	Noise immunity
Option D:	Less area of reception
13.	_____ is used in entertainment broadcasting, while _____ is employed for communications.
Option A:	Wideband FM, Narrowband FM
Option B:	Narrowband FM, Wideband FM
Option C:	Wideband FM, Wideband FM
Option D:	Narrowband FM, Narrowband FM
14.	A pre-emphasis circuit provides extra noise immunity by
Option A:	boosting the bass frequencies

Option B:	amplifying the higher audio frequencies
Option C:	pre amplifying the whole audio band
Option D:	converting the phase modulation to FM
15.	In a broadcast superheterodyne receiver, if the intermediate frequency is 455 KHz, the image frequency and rejection ratio at 25 MHz is
Option A:	2.59 MHz, 0.72
Option B:	100 MHz, 7.22
Option C:	28 MHz, 0.72
Option D:	25.91 MHz, 7.22
16.	Which of the following is not an effect of high value of intermediate frequency?
Option A:	Poor selectivity
Option B:	Poor adjacent channel rejection
Option C:	Poor image frequency rejection
Option D:	Tracking difficulties
17.	Calculate the Nyquist rate for sampling when a continuous time signal is given by $x(t) = 5 \cos 100\pi t + 10 \cos 200\pi t - 15 \cos 300\pi t$
Option A:	300Hz
Option B:	600Hz
Option C:	150Hz
Option D:	200Hz
18.	In pulse width modulation,
Option A:	Amplitude of the carrier pulse is varied
Option B:	Synchronization is not required between transmitter and receiver
Option C:	Instantaneous power at the transmitter is constant
Option D:	Frequency of the pulse is varied
19.	The digital modulation scheme in which the step size is not fixed is
Option A:	Delta modulation
Option B:	Adaptive delta modulation
Option C:	DPCM
Option D:	PCM
20.	Multiplexers in early TDM/PAM telemetry systems used a form of rotary switch known as a
Option A:	Telemetry
Option B:	Mixer
Option C:	Commutator
Option D:	Rotator

Q2 **(20 Marks)**	**Solve any Four out of Six** **5 marks each**
A	If an amplifier has bandwidth B=20 KHz and a total noise power N = 2 X 10^{-17} W. determine the total noise power if bandwidth i) increases to 40 KHz ii) decreases to 10 KHz.
B	Explain any four radio receiver characteristics. Why is AFC required in radio receivers?
C	Draw and explain Foster Seeley detector in short
D	Explain pre-emphasis and De-emphasis in detail.
E	Draw the transmitter and receiver of the FDM signal. Also draw the frequency spectrum of FDM signal
F	Calculate the percentage power saving when the carrier and one of the sidebands are suppressed in an AM wave modulated to a depth of (a) 100 percent and 50 percent.

Q3 **(20 Marks Each)**	**Solve any Two Questions out of Three** **10 marks each**
A	Explain the indirect method of FM generation in detail along with the phasor diagrams
B	Derive the expression of an Amplitude modulated wave. Draw the time domain and frequency domain waveforms. Also derive the bandwidth of AM
C	Explain the generation and detection of PPM waveforms in detail. Mention the advantages and disadvantages of PPM compared to other pulse modulation techniques