University of Mumbai

Examination 2020 under cluster 5 (Lead College: APSIT)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: Electronics & Telecommunication Engineering

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.	Noise Factor (F) and Noise Figure (NF) are related as
Option A:	NF = 10 log(F)
Option B:	F = 10 log10(NF)
Option C:	NF = 10 (F)
Option D:	F = 10 (NF)
2.	Overmodulation results in
Option A:	Weakening of the signal
Option B:	Excessive carrier power
Option C:	Distortion
Option D:	Signal boosting
3.	A 50 kW carrier is to be amplitude modulated to a level of 85%. What is the carrier power after modulation?
Option A:	50 kW
Option B:	5 kW
Option C:	8 kW
Option D:	25 kW
4.	An AM broadcast station transmits modulating frequencies up to 6 kHz. If the AM station is transmitting on a frequency of 894 kHz, the values for maximum and minimum upper and lower sidebands and the total bandwidth occupied by the AM station are:
Option A:	894 KHz, 884 KHz, 12 KHz
Option B:	894 KHz, 888 KHz, 6 KHz
Option C:	900 KHz, 888 KHz, 6 KHz
Option D:	900 KHz, 888 KHz, 12 KHz
5.	Which of the following modulating signal voltages would cause over-modulation on a carrier voltage of 15v?
Option A:	12V
Option B:	15V
Option C:	17V
Option D:	10V
6.	The advantages of DSB over SSB full carrier AM is:

Option A:	Less available channel space
Option B:	More stable transmitter gives better reception
Option C:	More power to transmit same signal
Option D:	Signal is less resistant to noise
7.	VSB modulation is preferred in TV because:
Option A:	it increases the bandwidth
Option B:	it decreases the bandwidth requirement to half
Option C:	it transmits more power
Option D:	simple modulator circuit
8.	Armstrong method is used for the generation of
Option A:	Direct FM
Option B:	Indirect FM
Option C:	SSB-SC
Option D:	DSB-SC
9.	What is the required bandwidth according to Carson's rule, when a 100 MHz carrier is modulated with a sinusoidal signal at 1KHz, the maximum frequency deviation being 50 KHz.
Option A:	1 KHz
Option B:	50 KHz
Option C:	102 KHz
Option D:	150 KHz
10.	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
11.	What is the value of carrier frequency in the following equation for the FM signal? v(t)= 5 cos (6600t+ 12sin2500t)
Option A:	1150 Hz
Option B:	6600 Hz
Option C:	2500 Hz
Option D:	1050 Hz
12.	VCO is used to generate
Option A:	Direct FM
Option B:	Indirect FM
Option C:	SSB-SC
Option D:	DSB-SC
13.	The term "Delayed AGC" implies Application of AGC
Option A:	After some time lag
Option B:	Only when signal strength has increased beyond a specified value
Option C:	To the last stage of receiver
Option D:	After switch of on-off switch

14.	Basically, selectivity measures:
Option A:	the range of frequencies that the receiver can select
Option B:	with two signals close in frequency, the ability to receive one and reject the other
Option C:	how well adjacent frequencies are separated by the demodulator
Option D:	how well the adjacent frequencies are separated in the mixer
15.	In a receiver, which of the following device has IF input but RF output?
Option A:	Demodulator
Option B:	Loudspeaker
Option C:	Audio amplifier
Option D:	Frequency changer
16.	Calculate the minimum sampling rate to avoid aliasing when a continuous time signal is given by $x(t) = 5 \cos 400\pi t$
Option A:	400 Hz
Option B:	250 Hz
Option C:	100 Hz
Option D:	800 Hz
17.	Multiplication of input signal with pulse train is done in ________ sampling.
Option A:	Impulse sampling
Option B:	Natural sampling
Option C:	Flat top sampling
Option D:	Direct sampling
18.	A PAM signal can be detected using
Option A:	Low pass filter
Option B:	High Pass filter
Option C:	Bandpass filter
Option D:	All pass filter
19.	Why is sync pulse required in TDM?
Option A:	to avoid interference
Option B:	to identify the beginning of frame
Option C:	to send message
Option D:	to carry information
20.	To combine the multiple signals in FDM the circuit required to be used is
Option A:	Oscillator
Option B:	filter
Option C:	linear mixer
Option D:	nonlinear mixer

Q2	**Solve any Four out of Six** **5 marks each**
A	Why is IF selected as 455 KHz in AM?
B	Draw the block diagram of digital communication and explain each block in short.
C	Explain FM demodulator using PLL with suitable diagram.
D	Define any 3 parameters of radio receivers.
E	State and explain the sampling theorem in brief.
F	Explain square law detector

Q3.	
A	**Solve any Two** **5 marks each**
i.	Explain varactor diode modulator
ii.	Explain frequency division multiplexing
iii.	Explain PAM signal generation and detection in brief.
B	**Solve any One** **10 marks each**
i.	Explain the working of Superheterodyne receiver in detail
ii.	The unmodulated carrier power of AM transmitter is 20 Kw and carrier frequency is 2 MHz. The carrier is modulated to a depth of 70% by an audio signal of 5KHz.Assume R=1Ω. i) Determine the total transmitted power. ii) Determine the SSB power. iii) Percentage of power saving if SSB is transmitted. iv) Draw the frequency spectrum and find the bandwidth.

University of Mumbai

Examination 2020 under cluster __ (Lead College: _________)

Program: **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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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
Q1. (s)	What is the suitable formula to find extremals of $\int_{x1}^{x2} 1+y^2-y'dx$
Option A:	$\frac{\partial F}{\partial y}=c$
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:	$F-y'\frac{\partial F}{\partial y'}=c$
2.(s)	Euler differential formula for extremals $\int_{x1}^{x2}(y''^2-y^2+x)dx$ is
Option A:	$\frac{\partial F}{\partial y}-\frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right)+\frac{d^2}{dx^2}\left(\frac{\partial F}{\partial y''}\right)=0$
Option B:	$\frac{\partial F}{\partial y}=c$
Option C:	$\frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right)=c$
Option D:	$\frac{\partial F}{\partial y'}=c$
3.D	Find extremals $\int_0^1 1+x^2y')y'dx$
Option A:	$y=c_1+c_2x$
Option B:	$y=c_1+c_2x^2$
Option C:	$y=\frac{c_1}{x}+c_2$
Option D:	$y=\frac{1}{2}(x^3+c_1)$
4.	The sets of functions $\{ f_1, f_2, f_3 \}$ where $f_1=x, f_2=x^2, f_3=x^3$ are
Option A:	Linearly dependent
Option B:	Linearly independent
Option C:	Linearly independent and satisfies $1+f_1+\frac{f_2}{2!}=f_3$
Option D:	Linearly dependent and satisfies $1+f_1+\frac{f_2}{2!}=f_3$

5.M	One of eigen vector of $A = \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}$ is
Option A:	$(1 \quad -2)'$
Option B:	$(2 \quad -2)'$
Option C:	$(1 \quad -1)'$
Option D:	$(1 \quad 2)'$
6.s	If the product of eigen values of $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ is 16 then thethird eigenvalue is
Option A:	0
Option B:	1
Option C:	2
Option D:	3
7.D	If A =1/2 $\begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$ then $4^A =$
Option A:	$\begin{bmatrix} 10 & -6 \\ 6 & 10 \end{bmatrix}$
Option B:	$\begin{bmatrix} 10 & 6 \\ 6 & 10 \end{bmatrix}$
Option C:	$\begin{bmatrix} 10 & 6 \\ -6 & 10 \end{bmatrix}$
Option D:	$\begin{bmatrix} -10 & 6 \\ 6 & -10 \end{bmatrix}$
8.s	Find the Euclidian norms of $u =$ (3 , -4 , 0 , 12)
Option A:	11
Option B:	12
Option C:	13
Option D:	0
9.m	If U = (3 , 4 , 2) and V = (4 , -3 , 1) Find d (U, V)
Option A:	$\sqrt{3}$
Option B:	$\sqrt{2}$
Option C:	$\sqrt{5}$
Option D:	$\sqrt{7}$
10.s	For solving the boundary value problem $\int_0^1 1 + x^2 y' dx$, y(0)=y(1) = 0using Rayleigh Ritz method , we assume the trial solution
Option A:	$\overline{y(x)} = c_1 x + c_2 x^2$
Option B:	$\overline{y(x)} = c_0 + c_2 x^2$
Option C:	$\overline{y(x)} = c_0 + c_1 x + c_2 x^2$
Option D:	$\overline{y(x)} = c_0 + c_1 x + c_2 x^2 + c_3 x^3$
11.d	The value of k for which u = (2 , 1 , 3) and v = (4 , 7 , k) are orthogonal is
Option A:	0
Option B:	-1
Option C:	-3

Option D:	-5
12.s	If a random variable has the moment generating function is $\frac{3}{3-t}$ then Mean and Standad deviation is given by
Option A:	1/2 , 1/2
Option B:	3 , 3
Option C:	1/3 , 1/3
Option D:	1 , 1
13.D	For a normally distributed variable X with mean 1 and standard distribution 3 , then the probability that -1.43 $\leq X \leq$ 6.19 is
Option A:	0.6792
Option B:	0.7492
Option C:	0.07492
Option D:	0.06792
14.M	Chance that one of the 10 telephone line is busy at an instance is 0.2 then the chance that five of the lines are busy is
Option A:	0.0264
Option B:	0.264
Option C:	0.00264
Option D:	0.000264
15.s	$r_{xy} = 0.4\ , COV(\,x\,, y\,) = 1.6\ , {\sigma^2}_y = 25\ then\ \sigma_{x=}$
Option A:	0.6
Option B:	0.7
Option C:	0.8
Option D:	0..9
16.D	The equations of the two lines of regression are $6y = 5\,x + 90$ are $15\,x = 8\,y + 130$ then coefficient of correlation is
Option A:	$r = -\frac{1}{3}$
Option B:	$r = \frac{2}{3}$
Option C:	$r = \frac{5}{3}$
Option D:	$r = 1$
17.M	The matrix A = $\begin{bmatrix} 2 & 3 \\ -3 & -4 \end{bmatrix}$ $is\ diagonalisable$, then diagonalizing matrix D =
Option A:	$\begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix}$
Option B:	$\begin{bmatrix} -1 & 0 \\ 0 & 2 \end{bmatrix}$
Option C:	$\begin{bmatrix} 1 & 0 \\ 0 & -2 \end{bmatrix}$
Option D:	$\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$
18.m	Evaluate $\int_0^{2+i} (\bar{z})^2\ dz$ along $y = \frac{x}{2}$

Option A:	$\frac{5}{3}(2-i)$
Option B:	$\frac{1}{3}(2-i)$
Option C:	$\frac{5}{3}(2+i)$
Option D:	$\frac{5}{3}(2-i)$
19.s	Evaluate $\int_c \frac{1}{(z+1)^4}$ where c is the circle $\|z\| = 0.1$
Option A:	1
Option B:	i
Option C:	2 π i
Option D:	0
20.D	The value of $\int_c \frac{1-\cos 2(z-3)}{(z-3)^3} dz$ where c is the curve $\|z-3\| = 1$ is
Option A:	4 π i
Option B:	0
Option C:	π i
Option D:	2 π i

Q2 (20 Marks)	Solve any Four out of Six 5 marks each
A	Find the extremal of $\int_0^{\frac{\pi}{2}}(y'^2 - y^2 + 2xy)dx$
B	Construct orthonormal basis of R^2 *using Gram Schmidth proess* to S = { (3 , 1) , (2 , 2)}
C	For $A = \begin{bmatrix} 1 & 2 & 0 \\ 2 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$ verify Cayley Hamilton Thm and hence find A^{-1}
D	Calculate spearman rank coefficient of correlation from following data X: 10, 12, 18, 18, 15, 40 y: 12, 18, 25, 25, 50, 25
E	Find the probability that at most 5 defective diodes will be found in a pack of 600 diodes if previous data shows that 3 % of such diodes are defective.
F	Evaluate $\int_c \frac{1}{(z)^2(z-1)(z+1)} dz$ where c is circle |z|=3

X	10	12	18	18	15	40
y	12	18	25	25	50	25

Q3 (20 Marks)	Solve any Four out of Six 5 marks each
A	Find the curve C of given length L which encloses a maximum area
B	Check whether V= R^3 is a vector space with respect to the operations (a , b) + (c , d) = (a + c , b +d – 3) , k (a , b) = (k a + k – 1 , k b + 1)
C	Find from the following values of the demand and the corresponding price of a commodity , the degree and price by computing Karl Pearson’s co-efficient of correlation

	Demand in quintals	65	66	67	67	68	69	70	72
	Price in paise per k.g	67	68	65	68	72	72	69	71
D	$Evaluate \int_0^{\infty} \frac{1}{(x)^4 + 16} dx$								
E	Is $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{bmatrix}$ Derogatory? Find its minimal polynomial.								
F	The ratio of the probability of 3 successes in 5 independent trials to the probability of 2 successes in 5 independent trials is $\frac{1}{4}$. What is the probability of 4 successes in 6 independent trials?								

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Examination 2020 under cluster 5(Lead College: APSIT)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: **Electronics & Telecommunication Engineering**

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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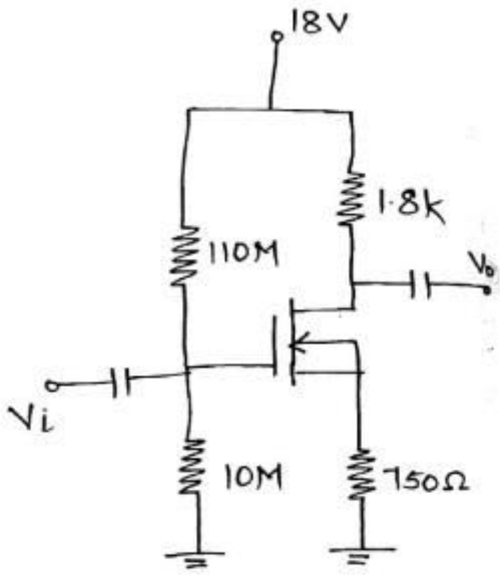
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	What is the frequency of oscillation for an RC phase shift oscillator with R of 10 kΩ and C of 0.001 μF in each of its RC sections?
Option A:	5 kHz
Option B:	5.5 kHz
Option C:	6 kHz
Option D:	6.5 kHz
2.	In designing of 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
3.	To obtain very high input and output impedance in a feedback amplifier, the topology mostly used is
Option A:	Voltage series
Option B:	Current shunt
Option C:	Voltage shunt
Option D:	Current series
4.	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
5.	In designing of cascade amplifier if the overall voltage gain is 110 and the relation between the voltage gains of individual stages is A_{V1} = 0.6 A_{V2} then calculate the gains of the first stage and second stage respectively are
Option A:	8.12, 13.54
Option B:	13.54, 8.12
Option C:	8.12, 25
Option D:	25, 8.12

6.	In case of Class A amplifier, the ratio of efficiency of transformer less amplifier to the efficiency of transformer coupled amplifier is
Option A:	2
Option B:	1.36
Option C:	1
Option D:	0.5
7.	Determine the frequency of oscillations of a Wein Bridge oscillator circuit having R as 10 kΩ and capacitor of 1 nF.
Option A:	15.92 kHz
Option B:	15.92 Hz
Option C:	30.15 kHz
Option D:	30.15 Hz
8.	In designing of CS-CE multistage amplifier if the lower cut-off frequency is 20 Hz, X_{CE2} = 100 Ω, then the value of the emitter bypass capacitor will be
Option A:	0.5 mF
Option B:	79.5 mF
Option C:	79.5 μF
Option D:	50 nF
9.	________________ is a fixed frequency oscillator
Option A:	Phase shift oscillator
Option B:	Hartley oscillator
Option C:	Colpitt's oscillator
Option D:	Crystal oscillator
10.	Ina negative feedback amplifier shunt mixing
Option A:	Tends to increase the input resistance
Option B:	Tends to decrease the input resistance
Option C:	Does not alter the input impedance
Option D:	Produces the same effect on input resistance as the series mixing
11.	For a Depletion MOSFET V_{GS}= - 3V, I_{DSS}=5mA, and I_D=2mA. Find the pinch of voltage V_P
Option A:	- 4.08 V
Option B:	- 8.16 V
Option C:	8.16 V
Option D:	0 V
12.	If a transistor is operated in such a way that output current flows for 60 ° of the input signal, then it is ___________ operation.
Option A:	Class B
Option B:	Class C
Option C:	Class A
Option D:	Class AB
13.	The advantage of using RC coupling technique in multistage amplifiers is
Option A:	Good impedance matching

Option B:	Maximum power transfer
Option C:	Simple circuit with low cost
Option D:	Operation point is shifted due to variation in temperature
14.	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
15.	An oscillator differs from an amplifier because it
Option A:	Has more gain
Option B:	Requires no input signal
Option C:	Requires no dc supply
Option D:	Always has the same input
16.	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
17.	Power amplifier generally uses transformer coupling because transformer permits
Option A:	Cooling of circuits
Option B:	Impedance matching
Option C:	Distortion less output
Option D:	Good frequency response
18.	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
19.	The feedback network of Colpitts oscillator consist of
Option A:	2 Inductor, 1 Capacitor
Option B:	1 Inductor, 1 Capacitor
Option C:	1 Inductor, 2 Capacitor
Option D:	2 Capacitor, 2 Inductor
20.	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}

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 CS-CS cascaded amplifier with bypassed source resistance.	10
B	Draw RC phase shift oscillator using BJT and derive the frequency of oscillation for the same.	10
C	For the n channel depletion type MOSFET , I_{DSS} = 6 mA, V_P = -3 V , R_1 = 110 MΩ, R_2 = 10 MΩ, R_D = 1.8 kΩ and R_S = 750 Ω  Find a) I_{DQ} b) V_{DSQ}	10
Q3	**Solve any Two questions out of three**	
A	Design the resistors of a 2 stage RC coupled CE-CE amplifier for the following parameters $A_V \geq 2500$, $f_L \geq 30$, $S \leq 8$, $V_O = 2.5$ V. Consider the following data for transistor BC147A , $V_{CE(sat)}$ = 0.25 V, hie = 2.7 kΩ, h_{FE} = 180, h_{fe} = 220	10
B	With the help of neat block diagram, derive the expression for R_{IF}, R_{OF}, G_{mF} for current series negative feedback amplifier.	10
C	Explain transformer coupled class A power amplifier with the help of a neat circuit diagram. Also draw ac and dc loadlines for the same. Derive expression for the power conversion efficiency.	

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Examination 2020 under cluster 5__(Lead College: ___APSIT______)

Examinations Commencing from 23rd December 2020 to 6th January 2021

Program: SEM IV CBCS

Curriculum Scheme: Rev 2016

Examination: SE Semester IV

Course Code: ECC403 and Course Name: LIC

Time: 2 hour Max. Marks: 80

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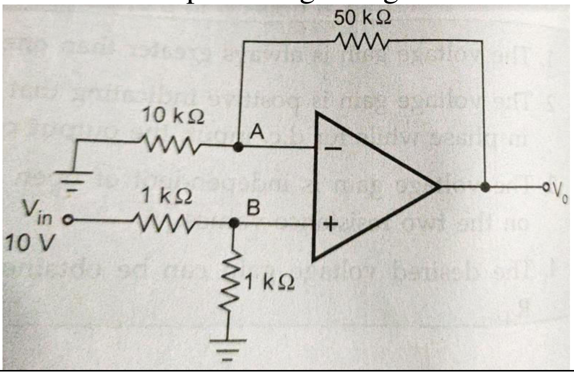
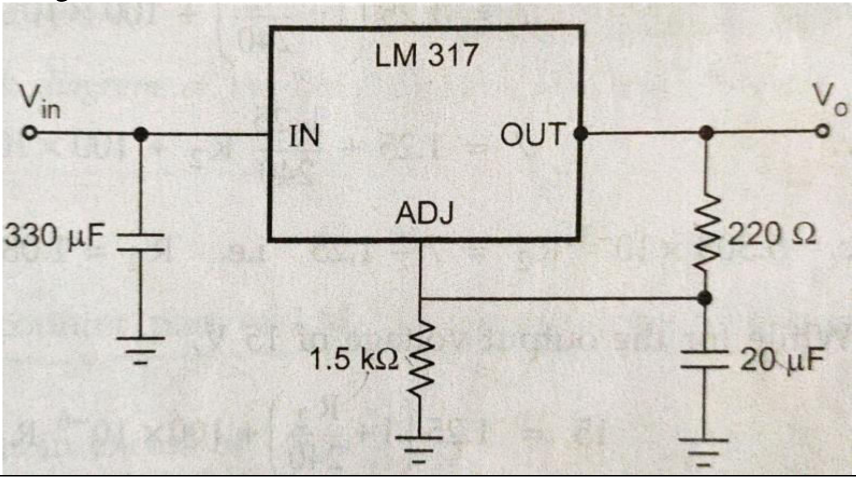
Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The input stage of operational amplifier is
Option A:	Single input balanced output
Option B:	Dual Input Balanced output
Option C:	Dual input unbalanced output
Option D:	Single input unbalanced output
2.	In a particular op-amp the input offset current is 20 nA while input bias current is 60nA. Calculate values of two bias currents.
Option A:	70nA, 50nA
Option B:	50nA, 50nA
Option C:	0, 20 nA
Option D:	50nA, 0nA
3.	Slew rate is defined as
Option A:	Rate of change of output voltage with time
Option B:	Rate of change of output current with time
Option C:	Rate of change of output voltage with current
Option D:	Rate of change of output current with voltage
4.	The output of a particular opamp increases 10 V in 12 μs. The slew rate is
Option A:	0.83 V/μs
Option B:	0.67 V/μs
Option C:	0 V/μs
Option D:	0.53 V/μs
5.	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
6.	In an inverting ideal integrator, which component exhibits the feedback path connection?
Option A:	R
Option B:	C
Option C:	L
Option D:	Diode

7.	A Non 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
8.	The filter having equal amplitude in all frequency
Option A:	Low pass filter
Option B:	High Pass filter
Option C:	Band pass filter
Option D:	All pass filter
9.	The gain of second order low pass filter decreases at the rate of
Option A:	20 dB/decade
Option B:	40 dB/decade
Option C:	60 dB/decade
Option D:	80 dB/decade
10.	A square waveform having ON time equal to its OFF time is fed as input to an integrator. The resulting output of the integrator is called
Option A:	Inverted Square waveform
Option B:	Sawtooth waveform
Option C:	Triangular waveform
Option D:	Sine waveform
11.	An 8 bit successive approximation ADC is driven by a 1 MHz clock. Find its conversion time.
Option A:	9 μsec
Option B:	10 μsec
Option C:	11 μsec
Option D:	20 μsec
12.	Find the resolution of a 10-bit AD converter for an input range of 10 V?
Option A:	97.7 mV
Option B:	9.77 mV
Option C:	0.977 mV
Option D:	977 mV
13.	Calculate the output voltage of 8 bit R-2R ladder DAC for given input 11011101 & given resolution is 0.0392
Option A:	8.66 V
Option B:	10 V
Option C:	1 V
Option D:	221 V
14.	A 555 timer is configured to run in astable mode with RA=RB=4kΩ, C=0.01 μF, Determine its duty cycle
Option A:	67%
Option B:	50%

Option C:	25%
Option D:	10%
15.	In 555 timer pin 1 is connected to
Option A:	VCC
Option B:	ground
Option C:	reset
Option D:	trigger
16.	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
17.	What is IC 723
Option A:	Voltage regulator
Option B:	clipper
Option C:	clamper
Option D:	Precision rectifier
18.	In IC7805 the output voltage is
Option A:	5 V
Option B:	0 V
Option C:	8 V
Option D:	7 V
19.	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
20.	The 7812 regulator IC provides ________.
Option A:	-12 V
Option B:	12 V
Option C:	5 V
Option D:	0 V

Q2	**Solve any Two Questions out of Three** **10 marks each**
A	Design an Inverting Schmitt Trigger for UTP=4 V, LTP=-4 V.Assume VCC = ± 12 V.
B	Design an astable multivibrator having an output frequency of 10 kHz with a duty cycle of 25% using IC 555.
C	Determine output voltage for given circuit 

Q3.	**Solve any Two Questions out of Three 10 marks each**
A	Design a practical integrator circuit with DC gain of 10 to integrate a square wave of 10 kHz
B	Design a wide band reject filter having fH=400 Hz & fL=2 kHz with a pass band gain of 2
C	Determine the regulated output voltage for LM317 voltage regulator shown in figure 

University of Mumbai

Examination 2020 under cluster 5 (Lead College: APSIT)

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: Electronics and Telecommunication Engineering

Curriculum Scheme: 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.	Unilateral Laplace Transform is applicable for the determination of linear constant coefficient differential equations with ______
Option A:	Zero initial condition
Option B:	Non-zero initial condition
Option C:	Zero final condition
Option D:	Non-zero final condition
2.	The complex exponential Fourier coefficient of a real valued time signal has
Option A:	Odd symmetry
Option B:	Even symmetry
Option C:	Conjugate symmetry
Option D:	No symmetry
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 unit step function is given as:
Option A:	$F(j\omega) = 1/j\omega$
Option B:	$F(j\omega) = j\omega$
Option C:	$F(j\omega) = j/\omega$
Option D:	$F(j\omega) = \omega/j$
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.	Circular convolution between two sequences $x_1(n)$ = {1,2,1,2} and x_2 (n) = { 2,1,2,1} is
Option A:	{8,8,8,8}
Option B:	{10,10,10,10}
Option C:	{10,8,10,8}
Option D:	{8,10,8,10}
10.	According to Parseval's theorem the energy spectral density curve is equal to?
Option A:	Area under magnitude of the signal
Option B:	Area under square of magnitude of the signal x(t)
Option C:	Area under square root of magnitude of the signal x(t)
Option D:	Area under cube root of magnitude of the signal x(t)
11.	A linear system is described by the following state equation· x(t)=AX(t)+BU(t), $$A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$$ The state-transition matrix of the system is
Option A:	$\begin{bmatrix} cost & sint \\ -sint & cost \end{bmatrix}$
Option B:	$\begin{bmatrix} -cost & sint \\ -sint & -cost \end{bmatrix}$
Option C:	$\begin{bmatrix} -cost & -sint \\ -sint & cost \end{bmatrix}$
Option D:	$\begin{bmatrix} cost & sint \\ cost & -sint \end{bmatrix}$
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.	What is the name given to lowest frequency in Fourier series
Option A:	Fundamental
Option B:	Series harmonic
Option C:	Second harmonic
Option D:	1 hertz signal

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 $f(t)=\sin500\pi t / \pi t$.
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.	Which among the following is a disadvantage of modern control theory?
Option A:	Implementation of optimal design
Option B:	Transfer function can also be defined for different initial conditions
Option C:	Analysis of all systems take place
Option D:	Necessity of computational work
19.	Which among the following constitute the state model of a system in addition to state equations?
Option A:	Input equations
Option B:	State trajectory
Option C:	Output equations
Option D:	State vector
20.	What is Fourier series?
Option A:	The representation of periodic signals in a mathematical manner is called a Fourier series
Option B:	The representation of non-periodic signals in a mathematical manner is called a Fourier series
Option C:	The representation of non-periodic signals in terms of complex exponentials or sinusoids is called a Fourier series
Option D:	The representation of periodic signals in terms of complex exponentials or sinusoids is called a Fourier series

Q2	Solve any Four out of Six **5 marks each**
A	State and prove time reversal property of Fourier series.
B	Determine the following systems are memory less, causal, linear or Time invariant $y(t)=x^2(t-to)+2$
C	Consider two LTI system connected in series, Their impulse resonse are $h_1[n]$ and $h_2[n]$ respectively, Find the output of the system if x[n] is the input being applied to one of the systems. $x[n]=\{1\uparrow,2\}$ $h_1[n]=\{1,0,-1\uparrow\}$ $h_2[n]=\{2\uparrow,1,-1\}$
D	Explain in Brief The ROC condition 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 produce 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 $X(s)=(3s+7)/(s2\ -s-12)$ 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. $Re(s)<-3$