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.

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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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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	D
Q2.	B
Q3.	B
Q4	C
Q5	C
Q6	A
Q7	D
Q8.	B
Q9.	C
Q10.	A
Q11.	C
Q12.	B
Q13.	C
Q14.	C
Q15.	C
Q16.	C
Q17.	B
Q18.	B
Q19.	D
Q20.	C

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

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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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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	B
Q2.	C
Q3.	C
Q4	A
Q5	D
Q6	B
Q7	C
Q8.	A
Q9.	C
Q10.	C
Q11.	A
Q12.	C
Q13.	A
Q14.	B
Q15.	D
Q16.	C
Q17.	A
Q18.	B
Q19.	B
Q20.	C

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. $Re(s)<-3$

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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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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	C
Q2.	D
Q3.	C
Q4	D
Q5	D
Q6	A
Q7	C
Q8.	C
Q9.	C
Q10.	A
Q11.	B
Q12.	B
Q13.	A
Q14.	B
Q15.	C
Q16.	B
Q17.	A
Q18.	B
Q19.	A
Q20.	A

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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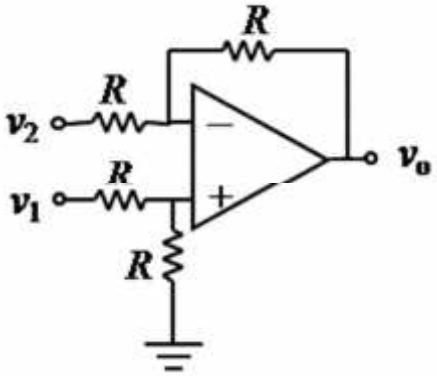
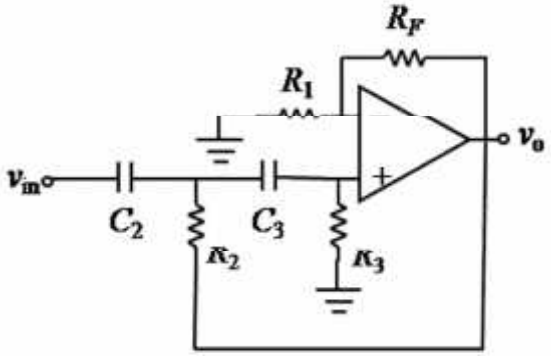
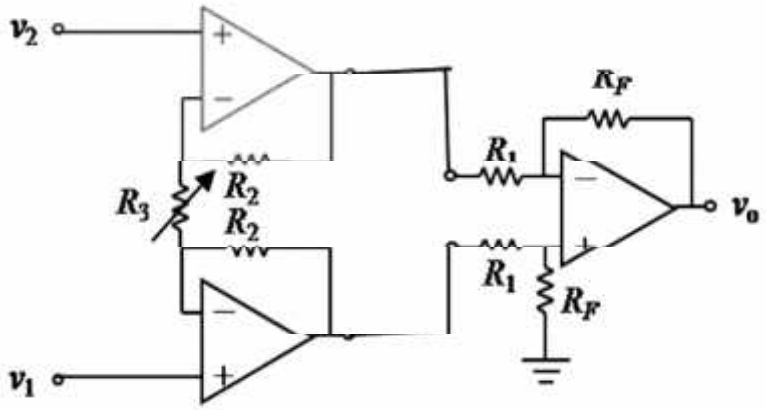
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	An ideal op-amp requires infinite bandwidth because
Option A:	Signals can be amplified without attenuation
Option B:	Output common-mode noise voltage is zero
Option C:	Output voltage occurs 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 June 2021
Examinations Commencing from 1st June 2021

Program: Electronics & Telecommunication

Curriculum Scheme: Rev2019

Examination: SE Semester: IV

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

Time: 2 hours Max. Marks: 80

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Question Number	Correct Option
Q1.	A
Q2.	D
Q3.	B
Q4	A
Q5	A
Q6	A
Q7	D
Q8.	B
Q9.	B
Q10.	C
Q11.	B
Q12.	A
Q13.	A
Q14.	C
Q15.	C
Q16.	B
Q17.	A
Q18.	C
Q19.	B
Q20.	C

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 $P(X \leq 2)$.
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 $f(x) = \begin{cases} \frac{3}{4}(2x - x^2) & ,0 \leq x \leq 2 \\ 0 & ,otherwise \end{cases}$
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 $f(z) = \frac{\sinh z}{z^7}$
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:	$2\pi ie$
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:	$\begin{vmatrix} 1 & -2 & 4 \\ -2 & 2 & 3 \\ 4 & 3 & -7 \end{vmatrix}$
Option B:	$\begin{vmatrix} 1 & -4 & 8 \\ -4 & 2 & 6 \\ 8 & 6 & -7 \end{vmatrix}$

Option C:	$\begin{vmatrix} 1 & 2 & 4 \\ 2 & 2 & 3 \\ 4 & 3 & -7 \end{vmatrix}$
Option D:	$\begin{vmatrix} 1 & 4 & 8 \\ 4 & 2 & 6 \\ 8 & 6 & 7 \end{vmatrix}$
17.	Find the rank , signature, index of the transformed quadratic form $3y_1^2 + \frac{2}{3}y_2^2 - \frac{39}{2}y_3^2$.
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 = $\int_{x_1}^{x_2} f(x, y, y', y'')dx$ to be an extremal is that
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:	$\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$
Option C:	$\frac{\partial f}{\partial y} + \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$
Option D:	$\frac{\partial f}{\partial y} + \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) + \frac{d^2}{dx^2}\left(\frac{\partial f}{\partial y''}\right) = 0$
19.	The functional I= $\int_a^b (y'^2 + 12xy)dx$ 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= $\int_a^b (16y^2 - y''^2 + x^2)dx$ is
Option A:	y = $c_1cos2x + c_2sin2x$
Option B:	y = $c_1e^{2x} + c_2e^{-2x}$
Option C:	y = $c_1e^{2x} + c_2e^{-2x} + c_3cos2x + c_4sin2x$
Option D:	y = $c_1e^{x} + c_2e^{-x} + c_3cosx + c_4sinx$

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 $A = \begin{vmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{vmatrix}$ 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:
$\sigma_x = 3$. 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 $\int_C \frac{\sin\pi z^2 + \cos\pi z^2}{(z-2)(z-3)}\,dz$ 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 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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Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	C
Q2.	B
Q3.	A
Q4	B
Q5	A
Q6	C
Q7	D
Q8.	B
Q9.	D
Q10.	B
Q11.	C
Q12.	A
Q13.	B
Q14.	D
Q15.	C
Q16.	A
Q17.	B
Q18.	A
Q19.	D
Q20.	C