University of Mumbai
Examination 2021 under cluster __ (Lead College: _____)
Examinations Commencing from 1st June 2021 to 10th June 2021
Program: **BE Electronics Engineering**
Curriculum Scheme: Rev 2019 'C' Scheme
Examination: SE Semester IV
Course Code: **ELC401**   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
	<table><tr><td>x</td><td>1</td><td>2</td><td>3</td></tr><tr><td>P(x)</td><td>a</td><td>2a</td><td>a</td></tr></table> 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 $f(x) =\begin{cases} \frac{3}{4}(2x - x^2) & ,0 \leq x \leq 2 \\ 0 & ,otherwise \end{cases}$
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:

	x	y
mean	53	142
variance	130	165

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:	$6\,\pi i$
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:	$2\pi i e^2$
Option C:	$2\pi i e$
Option D:	$\pi i e^2$
12.	Find the value of the integral $\int_0^{1+i}(x^2 - iy)dz$ along the path y = x
Option A:	$\dfrac{5-i}{6}$
Option B:	$\dfrac{5+i}{6}$
Option C:	$\dfrac{1+5i}{6}$
Option D:	$\dfrac{1-5i}{6}$
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 $x_1{}^2 + 2x_2{}^2 - 7x_3{}^2 - 4x_1 x_2 + 6x_2 x_3 + 8x_3 x_1$
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 $$3y_1{}^2 + \frac{2}{3}y_2{}^2 - \frac{39}{2}y_3{}^2.$$
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:	$c_1 x^3 + c_2 x$
Option B:	$x^2 + c_1 x + c_2$
Option C:	$c_1 x + c_2$
Option D:	$x^3 + c_1 x + c_2$
20.	The extremal of the functional $I = \int_a^b (16y^2 - y^{||^2} + x^2) dx$ is
Option A:	$y = c_1 \cos 2x + c_2 \sin 2x$
Option B:	$y = c_1 e^{2x} + c_2 e^{-2x}$
Option C:	$y = c_1 e^{2x} + c_2 e^{-2x} + c_3 \cos 2x + c_4 \sin 2x$
Option D:	$y = c_1 e^x + c_2 e^{-x} + c_3 \cos x + c_4 \sin x$

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
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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
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Y	62	58	68	45	81	60	68	48	50	70		
C	Obtain two distinct Laurent's series of $f(z) = \dfrac{2z-3}{z^2-4z+3}$ 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: $\sigma_x = 3$. 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 $\oint_C \dfrac{sin\pi z^2 + cos\pi z^2}{(z-2)(z-3)}\, dz$ 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 V is 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 06
(Lead College: Vidyavardhini's College of Engg Tech)
Examinations Commencing from June 01, 2021
Program: **Electronics Engineering**
Curriculum Scheme: Rev 2019
Examination: SE Semester IV
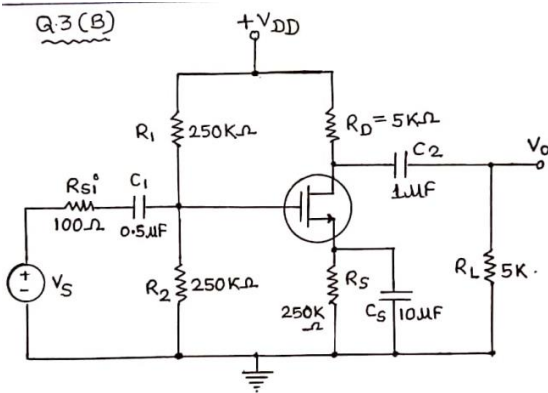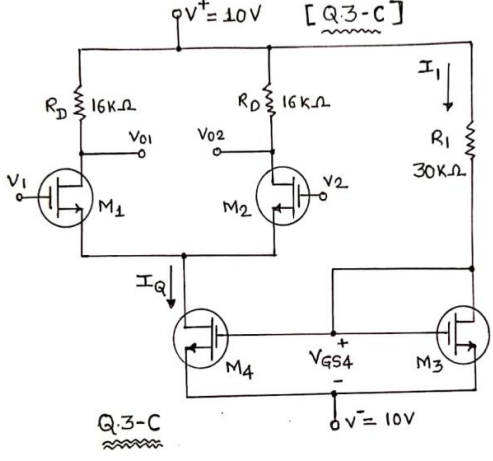Course Code: ELC402 and Course Name: Electronic Devices and Circuits-II

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.	Which capacitors assists in preventing the loss of gain due to negative feedback without affecting the DC stability of R-C Coupled amplifier?
Option A:	Coupling capacitors (Cc)
Option B:	Bypass capacitors (Cs)
Option C:	Internal Capacitance Cgd
Option D:	Internal Capacitance Cgs
2.	An amplifier has an input signal voltage of 0.054 mV. The output voltage is 12.5 V. The voltage gain in dB is….
Option A:	53.6 dB.
Option B:	107.3 dB.
Option C:	231 dB.
Option D:	116 dB.
3.	A certain amplifier has a bandwidth of 22.5 kHz with a lower cutoff frequency of 600 Hz. What is the value of upper cut-off frequency?
Option A:	600 Hz
Option B:	22.5 kHz
Option C:	23.1 kHz
Option D:	21.9 kHz
4.	In Current Shunt Negative feedback topology…......
Option A:	Ri Increases and Ro Decreases
Option B:	Ri Increases and Ro Increases
Option C:	Ri Decreases and Ro Decreases
Option D:	Ri Decreases and Ro Increases
5.	An amplifier has a Rin = 1.2 kΩ. The coupling capacitor is 1 µF. Determine the approximate lower cutoff frequency.
Option A:	132.62 Hz
Option B:	1.33 kHz
Option C:	13.3 kHz
Option D:	133.55 kHz
6.	The gain of an amplifier without feedback is 100 db. If a negative feedback of 3 db is applied, the gain of the amplifier will become …………..

Option A:	5 db
Option B:	300 db
Option C:	103 db
Option D:	97 db
7.	In Voltage Shunt Negative feedback topology….......
Option A:	Ri Increases and Ro Decreases
Option B:	Ri Increases and Ro Increases
Option C:	Ri Decreases and Ro Decreases
Option D:	Ri Decreases and Ro Increases
8.	If a three-stage amplifier has individual stage gains of 10 db, 5 db and 12 db, then total gain in db is ……….
Option A:	600 db
Option B:	24 db
Option C:	14 db
Option D:	27 db
9.	The frequency of oscillations in an LC oscillator is ……………. L or C.
Option A:	Inversely proportional to square root of
Option B:	Directly proportional to
Option C:	Proportional to square of
Option D:	Independent of the values of
10.	The total gain of a multistage amplifier is less than the product of the gains of individual stages due to …….
Option A:	Power loss in the coupling device
Option B:	Loading effect of the next stage
Option C:	The use of many transistors
Option D:	The use of many capacitors
11.	If, $\Theta JC=1.5\ ^0C/W$, $\Theta CS=1\ ^0C/W$, $\Theta SA=4\ ^0C/W$, $\Theta CA=50\ ^0C/W$, $T_{JMax}=100\ ^0C$ and $T_{AMB}=25\ ^0C$, then Maximum power dissipation with and without Heat Sink will be…..
Option A:	16.75W, 2.45W
Option B:	18.75W, 1.45W
Option C:	20.75W, 3.45W
Option D:	19.25W, 2.45W
12.	Phase shift provided by each one phase shift network in RC Phase Oscillator in 3 stage RC network is ………
Option A:	90 degrees
Option B:	180 degrees
Option C:	60 degrees
Option D:	120 degrees
13.	Maximum Power Conversion Efficiency of transformed coupled Class-A Power Amplifier is……..
Option A:	75%
Option B:	25%

Option C:	50%
Option D:	100%
14.	In Class-B Power Amplifier, Q-Point is located at…….
Option A:	Cut-off Point
Option B:	Saturation Point
Option C:	Middle of the DC Load Line
Option D:	After Cut-off Point
15.	If a power amplifier having zero signal power dissipation of 5 watts and a.c. power output of 2 watts, What will be the collector efficiency?
Option A:	20%
Option B:	40%
Option C:	80%
Option D:	50%
16.	What is the meaning of Dual Input Balanced Output?
Option A:	Output is measured between collectors of any one transistor and the Differential amplifier with two input signals
Option B:	Output is measured between two collectors of transistors and the Differential amplifier with two input signals
Option C:	Output is measured between collector of first transistor and the Differential amplifier with two input signals
Option D:	Output is measured between collector of second transistor and the Differential amplifier with two input signals
17.	A Differential Amplifier should have collector resistor's value (RC1 & RC2) as….
Option A:	10kΩ ,15kΩ
Option B:	15kΩ ,10kΩ
Option C:	15kΩ ,15kΩ
Option D:	15Ω ,15kΩ
18.	The value of emitter resistance in Emitter Biased circuit are RE1=25kΩ & RE2=20kΩ. Find RE
Option A:	45kΩ
Option B:	11.11kΩ
Option C:	5.11kΩ
Option D:	100kΩ
19.	One of the most important condition to get sustained oscillation is ………….
Option A:	A phase shift around the feedback loop of 0 degree or 360 degree
Option B:	A phase shift around the feedback loop of 180 degree
Option C:	A gain around the feedback loop of one-third
Option D:	A gain around the feedback loop of less than 1
20.	Why the size of Power MOSFET is made considerably large?
Option A:	To provide easy handling
Option B:	To dissipate Maximum Heat
Option C:	To get maximum Efficiency
Option D:	To facilitate connections

Q2 (20 Marks)	Solve any Four Questions out of Six 05 Marks each
A	Explain high frequency equivalent circuit of MOSFET.
B	Draw and explain the working principle of CASCODE amplifier using MOSFET.
C	What are the advantages and dis-advantages of negative feedback?
D	State and explain Barkhausen's criterion.
E	Draw the MOSFET differential amplifier with active load.
F	Draw and explain the working of Class-AB output stage with diode biasing

Q3 (20 Marks)	Solve any Two Questions out of Three 10 marks each
A	Draw transformer coupled Class-A Power amplifier and load line, derive the maximum power conversion efficiency for the same.
B	For the CS MOSFET amplifier shown in figure below, calculate the values of f_H and f_L. Assume the following values for the MOSFET. Cgd=2pF, Cgs=5pF, Rsi=100Ω, gm=10mS, C_1=0.5µF, C_2=1µF, Cs=10µF, R_1=R_2=250kΩ, R_D=5kΩ, R_S=250kΩ and R_L=5kΩ
C	For the MOSFET differential amplifier, the transistor parameters are K_{n1}=K_{n2}=0.1mA/V^2, K_{n3}=K_{n4}=0.3mA/V^2, V_{TN}=1V for all MOSFET's. λ=0 for M1, M2 and M3 and λ=0.01V^{-1} for M4. Determine the bias current I_Q, O/P resistance of current source, Ad, A_{CM} and CMRR

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(Lead College: Vidyavardhini's College of Engg Tech)
Examinations Commencing from June 01, 2021
Program: **Electronics Engineering**
Curriculum Scheme: Rev 2019
Examination: SE Semester IV
Course Code: ELC403 and Course Name: Microcontroller Applications

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.	8051 has _____ of ROM and _____ of RAM on chip
Option A:	64 KB, 4 KB
Option B:	60 KB, 4 KB
Option C:	8 KB, 128 Bytes
Option D:	4 KB, 128 Bytes
2.	8051 has _____ i/o ports of _____ each
Option A:	3, 8 bit
Option B:	4, 8 bit
Option C:	4, 16 bit
Option D:	2, 16 bit
3.	Which architecture provides common memory for program as well as data
Option A:	Harvard
Option B:	Von Neumann
Option C:	Harvard as well as Von Neumann
Option D:	Harvard derivatives
4.	The instruction MOVX A,@DPTR comes under _____ addressing mode
Option A:	Register
Option B:	Immediate
Option C:	Register Indirect
Option D:	Direct
5.	If A=0FH, B=0FH then on the execution of XRL A,B result in A will be
Option A:	00H
Option B:	0Fh
Option C:	F0H
Option D:	FFH
6.	If R0=35H and contents of the internal RAM [35H]=25H then on the execution of MOV A, @R0 contents of A will be
Option A:	35H
Option B:	25H
Option C:	70H

Option D:	00H
7.	The number of address and data lines available on 8051 are
Option A:	8-bit & 16-bit each
Option B:	8-bit & 8-bit each
Option C:	16-bit & 8-bit each
Option D:	16-bit & 16-bit each
8.	The counter inputs T0 & T1 are provided by which 2-port lines of 8051
Option A:	P3.4 & P3.5
Option B:	P3.6 & P3.7
Option C:	P3.2 & 3.3
Option D:	P3.0 & P3.1
9.	Which modes of the serial port of 8051 has fixed baud rate
Option A:	Mode 1 & Mode 3
Option B:	Mode 2 & Mode 3
Option C:	Mode 0 & Mode 2
Option D:	Mode 0 & Mode 1
10.	'Const' and 'Volatile' are the 2 types of _____ in Embedded C?
Option A:	Qualifiers
Option B:	Modifiers
Option C:	Data Types
Option D:	Integers
11.	To program Timer/Counter 0 as Timer in Mode 1, the TMOD is programmed with _____
Option A:	#08H
Option B:	#04H
Option C:	#0AH
Option D:	#01H
12.	The baud rate of the serial port in 8051 is _____ by setting the SMOD bit of PCON
Option A:	Halved
Option B:	Doubled
Option C:	Quadrupled
Option D:	Tripled
13.	Triggering level for #INT 0 & #INT 1 are programmed with _____ SFR
Option A:	TMOD
Option B:	TCON
Option C:	IE
Option D:	IP
14.	If the oscillator frequency is 12MHz, what will be the count value to be programmed in Timer-1 for the generation of 5 millisecond delay?
Option A:	TH1= 13H, TL1=88H
Option B:	TH1= 3CH, TL1=AFH

Option C:	TH1= FEH, TL1=0CH
Option D:	TH1= ECH, TL1=78H
15.	If equal priority is assigned for all the interrupts, which interrupt will be served first in 8051
Option A:	#INT 0
Option B:	#INT 1
Option C:	TFO
Option D:	TF1
16.	The Vector Address for Timer-0, overflow interrupt is _____
Option A:	001BH
Option B:	0013H
Option C:	000BH
Option D:	0003H
17.	Which port of 8051 requires external pullups
Option A:	Port 0
Option B:	Port 1
Option C:	Port 2
Option D:	Port 3
18.	If 8051 has Oscillator Frequency of 12MHz, then time for 1-machine cycle will be _____
Option A:	0.889μs
Option B:	1.2μs
Option C:	0.667μs
Option D:	1μs
19.	The 8051 controller does not have _____ on chip
Option A:	128 bytes of RAM
Option B:	4KB of ROM
Option C:	ADC
Option D:	2, 16 bit Timer/Counters
20.	User programmable bit is the part of data frame communicated in which modes of the serial port of 8051
Option A:	Mode 0 & Mode 1
Option B:	Mode 2 & Mode 3
Option C:	Mode 0 & Mode 2
Option D:	Mode 1 & Mode 2

Q2 (20 Marks)	Solve any Four	(5 Marks each)
A	Differentiate between RISC and CISC architecture	
B	Write a note on Addressing modes of 8051	
C	Discuss Power Saving Modes of 8051	
D	Discuss the terms, 'Data Types', 'Modifiers', Qualifiers' related to Embedded C Programming.	
E	Write a note on 'Memory Organization' in 8051	
F	What are 'Assembler Directives'? Explain with the examples.	

Q3 (20 Marks)	Solve any Two	(10 Marks each)
A	Design 8051 based system with following specifications. (i) 8051 CPU operating at 6 MHz (ii) 32 KB of RAM using 16 KB chips (iii) 8 KB of EPROM using 4 KB chips Design the system with proper interface diagram and memory map Note: #EA pin is grounded	
B	Interface 8 bit DAC with 8051, draw the logic interface diagram and write an embedded C program to generate continues rectangular wave of frequency 1KHz and duty cycle 40%. Assume the crystal clock frequency of 8051 as 12 MHz.	
C	Interface a 4 phase stepper motor with 8051, draw the logic interface and write an assembly language program to rotate the motor clock wise and anti-clock wise repeatedly for infinite time. Stepping patterns for the stepper motor to rotate clock wise are given as 05H,06H,0AH,09H.	

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Examinations Commencing from June 01, 2021
Program: **Electronics Engineering**
Curriculum Scheme: Rev 2019
Examination: SE Semester IV
Course Code: ELC404 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.	Emitter modulator amplifier for Amplitude Modulation
Option A:	Operates in class B mode
Option B:	Has a high efficiency
Option C:	Output power is very high
Option D:	Operates in class A mode
2.	A carrier is simultaneously modulated by two sine waves with modulation indices of 0.3 and 0.4. The total modulation index will be
Option A:	0.5
Option B:	0.7
Option C:	1
Option D:	Data is not sufficient
3.	For a 100% AM modulated wave with carrier suppressed, the percentage power saving will be
Option A:	100
Option B:	50
Option C:	55.55
Option D:	66.66
4.	Neutralization is used in RF amplifier to
Option A:	Improve stability
Option B:	Increase bandwidth
Option C:	Improve selectivity
Option D:	Improve gain
5.	Which is not necessarily an advantage of FM over AM
Option A:	Bandwidth saving
Option B:	Less modulating power
Option C:	Better noise immunity
Option D:	Transmitter power is more useful
6.	In FM frequency deviation is
Option A:	Proportional to modulating frequency
Option B:	Proportional to amplitude of modulating signal

Option C:	Constant
Option D:	Zero
7.	In an AM wave, the majority of the power is in ……………..
Option A:	Lower sideband
Option B:	Upper sideband
Option C:	Carrier
Option D:	Single side band
8.	Overmodulation results in …………..
Option A:	Weakening of the signal
Option B:	Excessive carrier power
Option C:	Distortion
Option D:	Better efficiency
9.	Demodulation is done in …………
Option A:	Receiving antenna
Option B:	Transmitter
Option C:	Radio receiver
Option D:	Transmitting antenna
10.	Superhertodyne principle refers to
Option A:	Using a large number of amplifier stages
Option B:	Using a push-pull circuit
Option C:	Obtaining lower fixed intermediate frequency
Option D:	Using a large number of oscillators
11.	For the transmission of normal speech signal, the PCM channel needs a bandwidth of
Option A:	64 KHz
Option B:	16 KHz
Option C:	8 KHz
Option D:	4 KHz
12.	The Nyquist rate of signal samples/sec
Option A:	Fm
Option B:	2 fm
Option C:	N fm
Option D:	2N fm
13.	Advantage of using direct method for generation of FM signal is
Option A:	It gives high stability to FM signal frequency
Option B:	It gives high deviation to FM signal frequency
Option C:	High power FM generation is possible
Option D:	Good noise immunity
14.	Sensitivity is defined as
Option A:	Ability of receiver to amplify weak signals
Option B:	Ability to reject unwanted signals
Option C:	Ability to convert incoming signal into Image Frequency

Option D:	Ability to reject noise
15.	Quantization noise occurs in
Option A:	PCM
Option B:	PAM
Option C:	PPM
Option D:	PWM
16.	DM is a special case of
Option A:	PAM
Option B:	PPM
Option C:	PWM
Option D:	PCM
17.	Modulation is done in
Option A:	Transmitter
Option B:	Radio receiver
Option C:	Between transmitter and radio receiver
Option D:	Multiplexer
18.	The function of multiplexing is
Option A:	To reduce the bandwidth of the signal to be transmitted
Option B:	To combine multiple data streams over a single data channel
Option C:	To allow multiple data streams over multiple channels in a prescribed format
Option D:	To match the frequencies of the signal at the transmitter as well as the receiver
19.	In a transmitter …………….. oscillator is used
Option A:	Hartley
Option B:	RC phase-shift
Option C:	Wien-bridge
Option D:	Crystal
20.	Pre- emphasis is required to
Option A:	To convert PM to FM
Option B:	Amplifying lower audio frequencies
Option C:	Boosting the bass frequencies
Option D:	Provide better noise immunity

Q2 (20 Marks)	Solve any Four out of Six	(5 marks each.)
A	Define modulation index and percentage modulation.	
B	Why SSB is preferred for transmission of good quality of signal?	
C	Write short note on delayed AGC.	
D	What is double spotting explain in brief.	
E	What is pre- emphasis and de- emphasis.	
F	Draw the circuit diagram for Lattice type balanced modulator and discuss its operation.	

Q3. (20 Marks)	Solve any Two Questions out of Three	(10 marks each.)
A	A sinusoidal carrier has an amplitude of 20V and frequency 200KHz. It is amplitude modulated of amplitude 6V and frequency 1KHz. Modulated voltage is developed across 80-ohm resistance. 1. Write the equation of modulated wave 2. Determine modulation index 3. Draw the spectrum of modulated wave 4. Calculate total average power	
B	State advantages of FM over AM. Why AM detector principle is not suitable to demodulate FM signal?	
C	What is compandor and why it is used in a PCM system.	

University of Mumbai
Examination 2021 under Cluster 06
(Lead College: Vidyavardhini's College of Engg Tech)
Examinations Commencing from June 01, 2021
Program: **Electronics Engineering**
Curriculum Scheme: Rev 2019
Examination: SE Semester IV
Course Code: ELC405 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.	y(t) = x(2t) represents a
Option A:	compressed signal
Option B:	expanded signal
Option C:	time- shifted signal
Option D:	amplitude scaled signal by the factor of 2
2.	The fundamental period of a signal x(t) = sin (30πt) is
Option A:	T = 1/30 sec
Option B:	T = 1/60 sec
Option C:	T = 1/15 sec
Option D:	T = 1/10 sec
3.	LTI system is said to be stable _____
Option A:	when bounded input produces a bounded output
Option B:	when bounded input produces a unbounded output
Option C:	when unbounded input produces a bounded output
Option D:	when unbounded input produces an unbounded output
4.	The process of conversion of continuous time signal into discrete time signal is known as
Option A:	Aliasing
Option B:	Convolution
Option C:	Sampling
Option D:	Filtering
5.	If L. T. $F(S) = \frac{5(S+250)}{S(S+100)}$, the final value of f(t) is
Option A:	0.5
Option B:	12.5
Option C:	125
Option D:	1250
6.	For the function $f(t) = e^{-at}u(t)$ the Laplace transform is
Option A:	a/S
Option B:	1/(S-a)
Option C:	1/(S+a)

Option D:	1/aS
7.	A system is said to be causal,
Option A:	If present output depend on present and future input
Option B:	If present output depend on present and past input
Option C:	If present output depend on future input
Option D:	If present output not depend on present input
8.	Duality Theorem / Property of Fourier Transform states that
Option A:	Shape of signal in time domain & shape of spectrum can be interchangeable
Option B:	Shape of signal in frequency domain & shape of spectrum can be interchangeable
Option C:	Shape of signal in time domain & shape of spectrum can never be interchangeable
Option D:	Shape of signal in frequency domain & shape of spectrum can never be interchangeable
9.	The discrete time system y(n) = x(n-3) – 4 x(n-10) is a
Option A:	Dynamic System
Option B:	Memoryless System
Option C:	Time varying System
Option D:	Non causal System
10.	Two Cascade connected discrete time systems with impulse responses h1(n) and h2(n) can be replaced by a single equivalent discrete time system with impulse response
Option A:	h1(n) * h2(n)
Option B:	h1(n) + h2(n)
Option C:	h1(n) - h2(n)
Option D:	h1(n)
11.	If x(t) and X(s) are Laplace transform pairs, then Laplace transform of e^{-at} x(t) is
Option A:	e^{-as} X(s)
Option B:	e^{as} X(s)
Option C:	X(s-a)
Option D:	X(s+a)
12.	Z transform of a ramp function x(n) = n u(n) is
Option A:	$X(z) = \dfrac{-z}{(z-1)^2}$
Option B:	$X(z) = \dfrac{4z}{(z-1)^2}$
Option C:	$X(z) = \dfrac{z}{(z+1)^2}$
Option D:	$X(z) = \dfrac{z}{(z-1)^2}$
13.	Choose the correct assertion stating the necessary condition for the existence of Fourier Transform of discrete time signal (DTFT)?
Option A:	Discrete Time Signal should be absolutely multipliable
Option B:	Discrete Time Signal should be absolutely differentiable
Option C:	Discrete Time Signal should be absolutely summable
Option D:	Discrete Time Signal should be absolutely integrable

14.	If x1(n)={1,2,3} and x2(n)={1,1,1}, then what is the convolution sequence of the given two signals?
Option A:	{1,2,3,1,1}
Option B:	{1,2,3,4,5}
Option C:	{1,3,5,6,2}
Option D:	{1,3,6,5,3}
15.	What is the ROC of the z-transform of the following signal? $x(n) = a^n u(n) + b^n u(-n-1)$
Option A:	$\|a\| < \|z\| < \|b\|$
Option B:	$\|a\| > \|z\| > \|b\|$
Option C:	$\|a\| > \|z\| < \|b\|$
Option D:	$\|a\| < \|z\| > \|b\|$
16.	What is the ROC of the system function H(z) if the discrete time LTI system is BIBO stable?
Option A:	Entire z-plane, except at z=0
Option B:	Entire z-plane, except at z=∞
Option C:	Exterior of circle with radius |Z|=1
Option D:	Ring with inner radius less than |Z|=1 and outer radius greater than |Z|=1 (contains unit circle)
17.	Fourier Transform of Unit Impulse Signal is
Option A:	∞
Option B:	1
Option C:	0
Option D:	-1
18.	What is the spectrum that is obtained when we plot $\|C_k\|^2$ as a function of frequencies kf_0, where, k=0,±1,±2....?
Option A:	Frequency spectrum
Option B:	Power density spectrum
Option C:	Energy spectrum
Option D:	Probability density function
19.	Choose the correct expression for Fourier series coefficient C_k in terms of the discrete signal x(n).
Option A:	$\frac{1}{N}\sum_{n=0}^{N-1} x(n) e^{\frac{j2\pi nk}{N}}$
Option B:	$\frac{1}{N}\sum_{n=0}^{N-1} x(n) e^{\frac{-j2\pi nk}{N}}$

Option C:	$\dfrac{1}{N}\displaystyle\sum_{n=0}^{N+1} x(n)e^{\frac{j2\pi nk}{N}}$
Option D:	$\dfrac{1}{N}\displaystyle\sum_{n=0}^{N+1} x(n)e^{\frac{-j2\pi nk}{N}}$
20.	If $X(\omega)$ is the Fourier transform of the signal $x(n)$, then what is the Fourier transform of the signal $x(n-k)$?
Option A:	$e^{j\omega k}X(\omega)$
Option B:	$e^{j\omega k}X(-\omega)$
Option C:	$e^{-j\omega k}X(\omega)$
Option D:	$e^{-j\omega k}X(-\omega)$

Q2 (20 Marks Each)	
A	**Solve any Two** **5 marks each**
i.	For the given signal x[n] ={-3,-2,-1,0,1,2,3} where 4th sample is at origin sketch the following signals a) x[n] b) x[n-2] c) x[3-n] d) x[n+2]u[n]
ii.	Explain Dirichlet conditions.
iii.	State and prove convolution property of DTFT
B	**Solve any One** **10 marks each**
i.	A continuous time LTI system is represented by differential equation $\dfrac{d^2y(t)}{dt^2} + 3\dfrac{dy(t)}{dt} + 2y(t) = 2x(t)$ assume all initial conditions zero 1. Determine transfer function 2. Determine impulse response of the system. 3. Find response of the system to an input signal x(t) =4e^{-3t} u(t)
ii.	A continuous time signal is given $x(t) = \begin{cases} 1, & -1 \le t \le 1 \\ 0, & \text{elsewhere} \end{cases}$ Sketch the following transformed signals 1. x(t) 2. x(t-3) 3. 2x(t) 4. x(5-t) 5. x(4t)

Q3. **(20 Marks Each)**	
A	**Solve any Two** **5 marks each**

i.	Determine power and energy for the following signals
	    1. $x(t) = 3 \cos (5\omega t)$
	    2. $x[n] = \left(\frac{1}{4}\right)^n u(n)$

ii.	Obtain the CT Fourier transform of signum function.
iii.	Explain causality and stability condition for LTI system.
B	**Solve any One** **10 marks each**

i.	The system function of LTI system is given as
	
	$H(z) = \dfrac{3z^2 - 4z}{z^2 - 3.5z + 1.5}$ specify the ROC of H(z) and determine the impulse response h(n) for the following conditions
	    1. Stable system
	    2. Causal system
	    3. Anticausal system

ii.	Convolve $x(t) = \begin{cases} 1, & 0 \le t < 1 \\ 0 & \text{elsewhere} \end{cases}$ $h(t) = \begin{cases} 1, & 0 \le t < 1 \\ 0 & \text{elsewhere} \end{cases}$