K. J. Somaiya Institute of Engineering and Information Technology
Sion, Mumbai - 400022
NAAC Accredited Institute with 'A' Grade
NBA Accredited 3 Programs
(Computer Engineering, Electronics & Telecommunication Engineering and Electronics Engineering)
Permanently Affiliated to University of Mumbai

EXAMINATION TIME TABLE (JANUARY 2021)

PROGRAMME - S.E. (Electronics) (REV. -2016) (Choice Based)

SEMESTER - III

Days and Dates	Time	Course Code	Paper
08 January 2021	12:30 p.m. to 02:30 p.m.	ELX301	APPLIED MATHEMATICS III
11 January 2021	12:30 p.m. to 02:30 p.m.	ELX302	ELECTRONICS DEVICES & CIRCUITS I
13 January 2021	12:30 p.m. to 02:30 p.m.	ELX303	DIGITAL CIRCUIT DESIGN
15 January 2021	12:30 p.m. to 02:30 p.m.	ELX304	ELECTRICAL NETWORK ANALYSIS AND SYNTHESIS
18 January 2021	12:30 p.m. to 02:30 p.m.	ELX305	ELECTRONIC INSTRUMENTS AND MEASUREMENT

Important Note: ● Change if any, in the time table shall be communicated on the college web site.

Mumbai
20th December, 2020.

Principal

University of Mumbai

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: **BE Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: SE Semester III

Course Code: **ELX301** and Course Name: **Applied Mathematics III**

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**
1.	Find Laplace transform of $f(t) = 1,\ 0 < t < 1$
Option A:	$\frac{1-e^{-s}}{s}$
Option B:	$\frac{1}{s}e^{-s}$
Option C:	$\frac{1}{s}$
Option D:	$\frac{1+e^{-s}}{s}$
2.	The Laplace Transform of $cos^2 t$ is
Option A:	$\left[\frac{1}{s} - \frac{s}{s^2+1}\right]$
Option B:	$\left[\frac{1}{s} - \frac{s}{s^2+4}\right]$
Option C:	$\frac{1}{2}\left[\frac{1}{s} + \frac{s}{s^2+4}\right]$
Option D:	$\frac{1}{2}\left[\frac{1}{s} - \frac{s}{s^2+1}\right]$
3.	Find $L[e^{-2t}sin3t]$
Option A:	$\frac{3}{(s+2)^2+9}$
Option B:	$\frac{3}{(s-2)^2+9}$
Option C:	$\frac{1}{(s+2)^2+9}$
Option D:	$\frac{1}{s^2+9}$
4.	Find $L\left[\int_0^t \frac{sinu}{u} du\right]$
Option A:	$tan^{-1}s$
Option B:	$\frac{tan^{-1}s}{s}$
Option C:	$cot^{-1}s$
Option D:	$\frac{cot^{-1}s}{s}$

5.	$L^{-1}\left[\frac{s+5}{s^2-25}\right]$ =?
Option A:	$cos5t + 5\,sin5t$
Option B:	$cosh5t + \ sinh5t$
Option C:	$cosh5t + 5sinh5t$
Option D:	$cosht + 5\,sinht$
6.	Find $1 * \ e^{-at}$
Option A:	$1 - e^{-at}$
Option B:	$\frac{1+e^{-at}}{a}$
Option C:	$\frac{e^{-at}-1}{a}$
Option D:	$\frac{1-e^{-at}}{a}$
7.	In Fourier series of $f(x) = xsinx$ in $(-\pi, \pi)$. The value of b_n is
Option A:	0
Option B:	$\frac{-1}{2}$
Option C:	$\frac{(-1)^n}{n^2-1}$
Option D:	$\frac{1}{n^2-1}$
8.	$f(x) = x - x^2$ is
Option A:	even function
Option B:	odd function
Option C:	Both even and odd function
Option D:	neither even nor odd
9.	The Fourier series in $(0,2\pi)$ for x^2 is, $x^2 = \frac{4\pi^2}{3} + 4\sum_{n=1}^{\infty}\frac{1}{n^2}\cos nx - 4\pi\sum_{n=1}^{\infty}\frac{1}{n}\sin nx$. For what value of x we can obtain , $\frac{\pi^2}{3} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \cdots$
Option A:	π
Option B:	$-\pi$
Option C:	0
Option D:	$2\,\pi$
10.	A function f(t) is periodic with period T if
Option A:	f(t+T)=0
Option B:	f(t+ T)= f(t)
Option C:	f(t+ T)= -f(t)
Option D:	f(t + T) = 2π
11.	Let $\varphi = x^2 - 2yz + 3z^2$, find $\nabla\varphi$ at $(1,-2,1)$
Option A:	$2i - 2j + 2k$

Option B:	$2i + 2j + 2k$
Option C:	$2xi - 2yj + 2zk$
Option D:	6
12.	If $\bar{F} = (x + 2y + az)\bar{\imath} + (bx - 3y - z)\bar{\jmath} + (4x + cy + 2z)\bar{k}$ is irrotational then
Option A:	$a = -4, b = 2, c = -1$
Option B:	$a = 4, b = 2, c = 1$
Option C:	$a = 4, b = 2, c = -1$
Option D:	$a = -4, b = -2, c = -1$
13.	Find $curl\ \bar{F}$ where $\bar{F} = (y^2 cosx + z^3)i + (2ysinx - 4)j + (3xz^2 + 2)k$
Option A:	0
Option B:	1
Option C:	$6yi + 6xzk$
Option D:	6
14.	Gauss Divergence theorem expresses
Option A:	The surface integral as a line integral
Option B:	The volume integral as a line integral
Option C:	The surface integral as a volume integral
Option D:	The volume integral as a line integral
15.	Integrate $\bar{F} = x^2 i + xy\, j$ from (0,0) to (1,1) along the parabola $y^2 = x$.
Option A:	$\frac{5}{12}$
Option B:	$\frac{1}{12}$
Option C:	$\frac{7}{12}$
Option D:	$\frac{3}{12}$
16.	Which of the following functions is NOT analytic
Option A:	Sinhz
Option B:	$\bar{z}$
Option C:	e^z
Option D:	Sinz
17.	Find the fixed points of the transformation $w = \frac{zi+1}{z+3i}$
Option A:	i
Option B:	$-i$

Option C:	1
Option D:	-1
18.	Which of the following statement is true
Option A:	A bilinear transformation is a combination of basic transformation translation, rotation and inversion
Option B:	A bilinear transformation is known as Mobius Transformation
Option C:	Every Bilinear transformation is conformal
Option D:	All options are TRUE
19.	Which of the following property of Bessel function is corect
Option A:	$J_{-n}(X) = (-1)^n J_n(X)$
Option B:	$J_{-n}(X) = J_n(X)$
Option C:	$J_{-n}(X) = nJ_n(X)$
Option D:	$J_{-n}(X) = -J_n(X)$
20.	The expansion of $cosx$ in the form of Bessel function is
Option A:	$cosx = 1 + 2J_0 + 2J_2 + 2J_4 + 2J_{6+\cdots..}$
Option B:	$cosx = 2J_0 - 2J_2 + 2J_4 - 2J_{6+\cdots..}$
Option C:	$cosx = J_0 + 2J_2 + 2J_4 + 2J_{6+\cdots..}$
Option D:	$cosx = J_0 - 2J_2 + 2J_4 - 2J_{6+\cdots..}$

Q2. **(20 Marks Each)**	**Solve any Four out of Six** **5 marks each**
A	*Find* $L\left[e^{-t}\int_0^t e^u \, coshu \, du\right]$
B	*Solve by using Laplace transform* $(D^2 + 4D + 8)y = 1$ *where y(0)=0, y'(0)=1*
C	*Obtain the complex form of Fourier series for* e^{-x} *in* $(-\pi, \pi)$
D	$\bar{F} = (x^2 - yz)i + (y^2 - zx)j + (z^2 - xy)k$ is irrotational. Find its Scalar potential.
E	Evaluate by using Green's theorem $\int_C (xy + y^2)dx + x^2dy$, where C is the closed region bounded *by* $y = x$ and $y = x^2$
F	Find the bilinear transformation which maps the points $z = 0,1,\infty$ onto $w = -5,-1,3$

Q3. **(20 Marks Each)**	**Solve any Four out of Six** **5 marks each**
A	*Evaluate* $\int_0^\infty e^{-2t}\left(\frac{cos2t - cost}{t}\right) dt$
B	*Find* $L^{-1}\left[log\left(\frac{s^2+4}{s^2+9}\right)\right]$
C	*Obtain the half range Fourier cosine series expansion for* $f(x) = x(\pi - x)$ *in* $(0, \pi)$
D	Show that $\bar{F} = (y^2 - z^2 + 3yz - 2x)i + (3xz + 2xy)j + (3xy - 2xz +$

	$2z)k$ is both irrotational and solenoidal.
E	Evaluate by using Stoke's theorem $\int_C \bar{F}\,\overline{dr}$ where $\bar{F} = x^2 i + xy\,j$ and C is the boundary of the rectangle x=0,y=0, x=1, y=1
F	Prove that $\frac{d}{dx}[xJ_n(x)J_{n+1}(x)] = x\left[{J_n}^2(x) - {J_{n+1}}^2(x)\right]$

University of Mumbai

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: **BE Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: SE Semester III

Course Code: **ELX301** and Course Name: **Applied Mathematics III**

Time: 2 hour Max. Marks: 80

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

University of Mumbai
Examination 2020 under Cluster 06
(Lead College: Vidyavardhini's College of Engg Tech)

Examination Commencing from 7th January 2020 to 20th January 2021

Program: **Electronics Engineering**

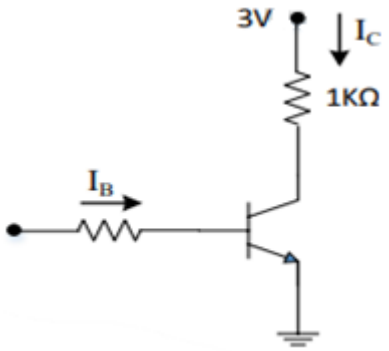
Curriculum Scheme: Rev 2016

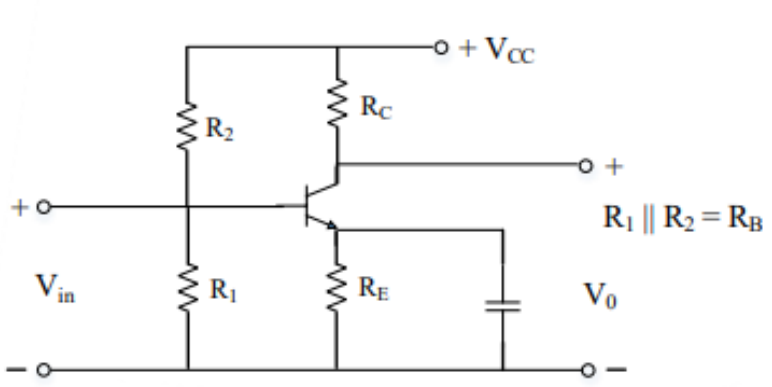
Examination: SE Semester III

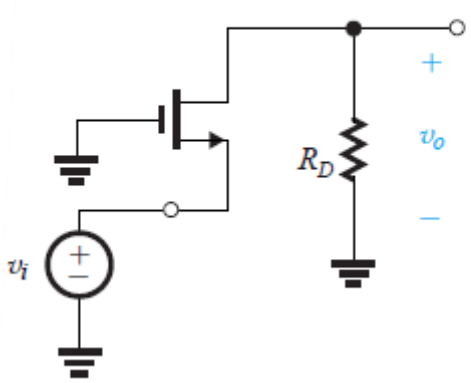
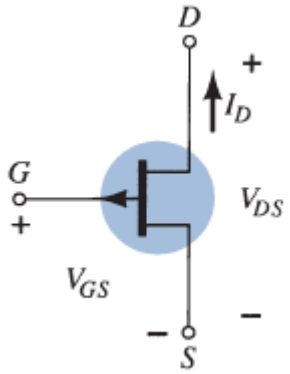
Course Code: ELX302 and Course Name: Electronic Devices and Circuits-I

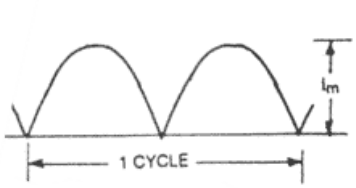
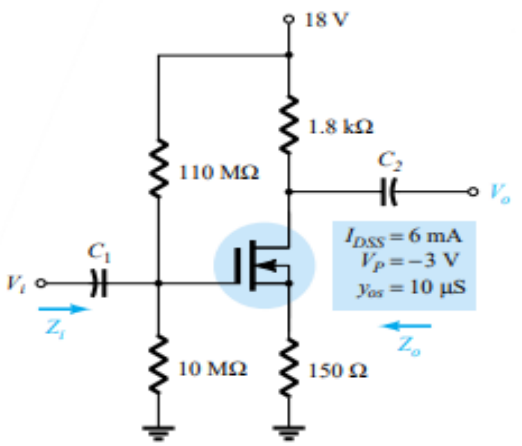
Time: 2 hour Max. Marks: 80

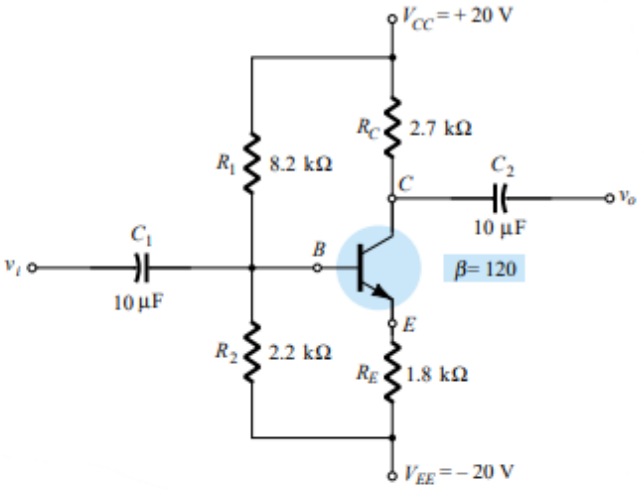
1. 40 marks	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks.**
1.	When a reverse bias is applied to a diode, it will
Option A:	Raise the potential barrier
Option B:	Lower the potential barrier
Option C:	Increases the majority-carrier current greatly
Option D:	Reduces the depletion region
2.	The thermal voltage V_T in diode current equation determined by----------.
Option A:	$V_T = \frac{kT_K}{tq}$
Option B:	$V_T = \frac{T_K}{q}$
Option C:	$V_T = \frac{kT_K}{q}$
Option D:	$V_T = \frac{k_K}{q}$
3.	A forward potential of 10V is applied to a Si diode. A resistance of 1 KΩ is also in series with the diode. The current is
Option A:	9.3 mA
Option B:	10mA
Option C:	10A
Option D:	0.7mA
4.	Avalanche breakdown in a diode occurs when
Option A:	Potential barrier is reduced to zero.
Option B:	Forward current exceeds certain value.
Option C:	Reverse bias exceeds a certain value.
Option D:	breakdown point
5.	In a transistor, Ic = 100 mA and IE = 100.2 mA. The value of β is ……
Option A:	100
Option B:	0.2
Option C:	1

Option D:	200
6.	In the active region of a common-emitter amplifier the collector-base junction is _____ while the base-emitter junction is _____.
Option A:	reverse-biased, forward-biased.
Option B:	forward-biased, forward-biased.
Option C:	forward-biased, reverse-biased
Option D:	reverse-biased, reverse-biased
7.	Assuming VCE(sat)=0.2V and β=50, the minimum base current IB equired to drive the transistor in the figure to saturation is 
Option A:	140 µA
Option B:	56 µA
Option C:	60 µA
Option D:	3 µA
8.	A common emitter transistor amplifier has a collector current of 1.0 mA when it's a base current is 25 µ A. What is the value of β?
Option A:	100
Option B:	40
Option C:	200
Option D:	0.4
9.	For good stabilized biasing of the transistor of the CE amplifier of figure we should have

	
Option A:	$RE/\ RB \ll 1$
Option B:	$RE/\ RB \gg 1$
Option C:	$RE/\ RB \ll$ hfe
Option D:	$RE\ /RB \gg h$fe
10.	The quiescent collector current IC of a transistor is increased by changing resistances. As a result
Option A:	gm will not be affected
Option B:	gm will decrease
Option C:	gm will increase
Option D:	gm will increase or decrease depending upon bias stability
11.	One of the most important characteristics of the FET is its ----------.
Option A:	high output impedance
Option B:	high current gain
Option C:	high input impedance
Option D:	high voltage gain
12.	There is no direct electrical connection between the gate terminal and the channel of a ----------.
Option A:	MOSFET
Option B:	BJT
Option C:	DIAC
Option D:	DIODE
13.	For E-MOSFETs, the relationship between output current and controlling voltage is defined by----------.
Option A:	$I_D = (V_{GS} - V_{GS(Th)})^2$
Option B:	$I_D = k(V_{GS} - V_{SB})^2$
Option C:	$I_D = k(V_{GS} - V_{DS})^2$
Option D:	$I_D = k(V_{GS} - V_{GS(Th)})^2$

14.	The MOSFETin the following circuit is in which configuration? 
Option A:	CS
Option B:	CG
Option C:	CD
Option D:	CC
15.	Identify the symbol: 
Option A:	p-channel JFET
Option B:	n-channel JFET
Option C:	p-channel MOSFET
Option D:	n-channel MOSFET
16.	In a photodiode, when there is no incident light, the reverse current is almost negligible and is called
Option A:	Zener current
Option B:	Dark current
Option C:	Photocurrent
Option D:	PIN current
17.	designed to operate as a photovoltaic device.
Option A:	Solar Cell
Option B:	Schottky diode
Option C:	Light Emitting Diode
Option D:	Varactor diode

18.	For full wave rectified sine wave, rms value is 
Option A:	0.707 i_m
Option B:	0.6036 i_m
Option C:	0.5 i_m
Option D:	0.318 i_m
19.	The value of inductance at which the current in a choke filter does not fall to zero is_____
Option A:	peak inductance
Option B:	critical inductance
Option C:	cut-in inductance
Option D:	damping inductance
20	The maximum efficiency of full wave rectification is
Option A:	40.6%
Option B:	100%
Option C:	81.2%
Option D:	85.6%
Q 2 **20 Marks**	
A	**Solve any Two 5 marks each**
i	Explain the construction & working principle of EMOSFET with neat diagrams.
ii	Explain biasing methods of BJT
iii	Determine Zi, Zo and voltage gain for the given circuit, if VGSQ=0.35 V & IDQ=7.6 mA. Given IDSS=6mA 

B	**Solve any One 10 marks each**
i	Perform dc analysis on voltage divider biasing circuit of n-channel E-MOSFET to obtain IDQ, VGSQ and VDSQ.
ii	Determine Vc and VB for the given network. 
Q 3 **20 Marks**	
A	**Solve any Two 5 marks each**
i	Explain the construction, working and characteristics of LED
ii	Draw bridge rectifier circuit and explain working with waveforms.
iii	Write short note on Clipper circuit.
B	**Solve any One 10 marks each**
i	Design a single stage CE Amplifier to give a voltage gain Av≥ 125 with stability factor S≤10 and output voltage of, Vo rms=3V. Assume Vcc=18V and VBE=0.7V. Use npn transistor with specifications: hfe (min)=145, hfe(typ)=180, hie=4.5kΩ, and frequency FL≤ 50 Hz (10)
ii	Draw voltage divider bias CE amplifier circuit and obtain the expression for input impedance (Zi), output impedance (Zo), voltage gain (Av) and current gain (Ai).

University of Mumbai
Examination 2020 under Cluster 06
(Lead College: Vidyavardhini's College of Engg Tech)

Examination Commencing from 7th January 2020 to 20th January 2021

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: SE Semester III

Course Code: ELX302 and Course Name: Electronic Devices and Circuits-I

Time: 2 hour Max. Marks: 80

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Q1:

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

Qus 2 A (iii)

$$g_{mo} = \frac{2I_{DSS}}{|V_p|} = 4\,ms$$

$$g_m = g_{mo}\left[1 - \frac{V_{GS}}{V_p}\right] = 4.47\,ms$$

$$r_d = \frac{1}{y_{os}} = 100K$$

$$Z_i = R_1 \| R_2 = 9.17\,M\Omega$$

$$Z_o = r_d \| R_D = 1.77\,k\Omega$$

$$A_v = -g_m(r_d \| R_D) = -7.8$$

Q 2 B - ii

$$R_{Th} = 1.73\,k\Omega$$

$$I = \frac{V_{CC} + V_{EE}}{R_1 + R_2} = 3.85\,mA$$

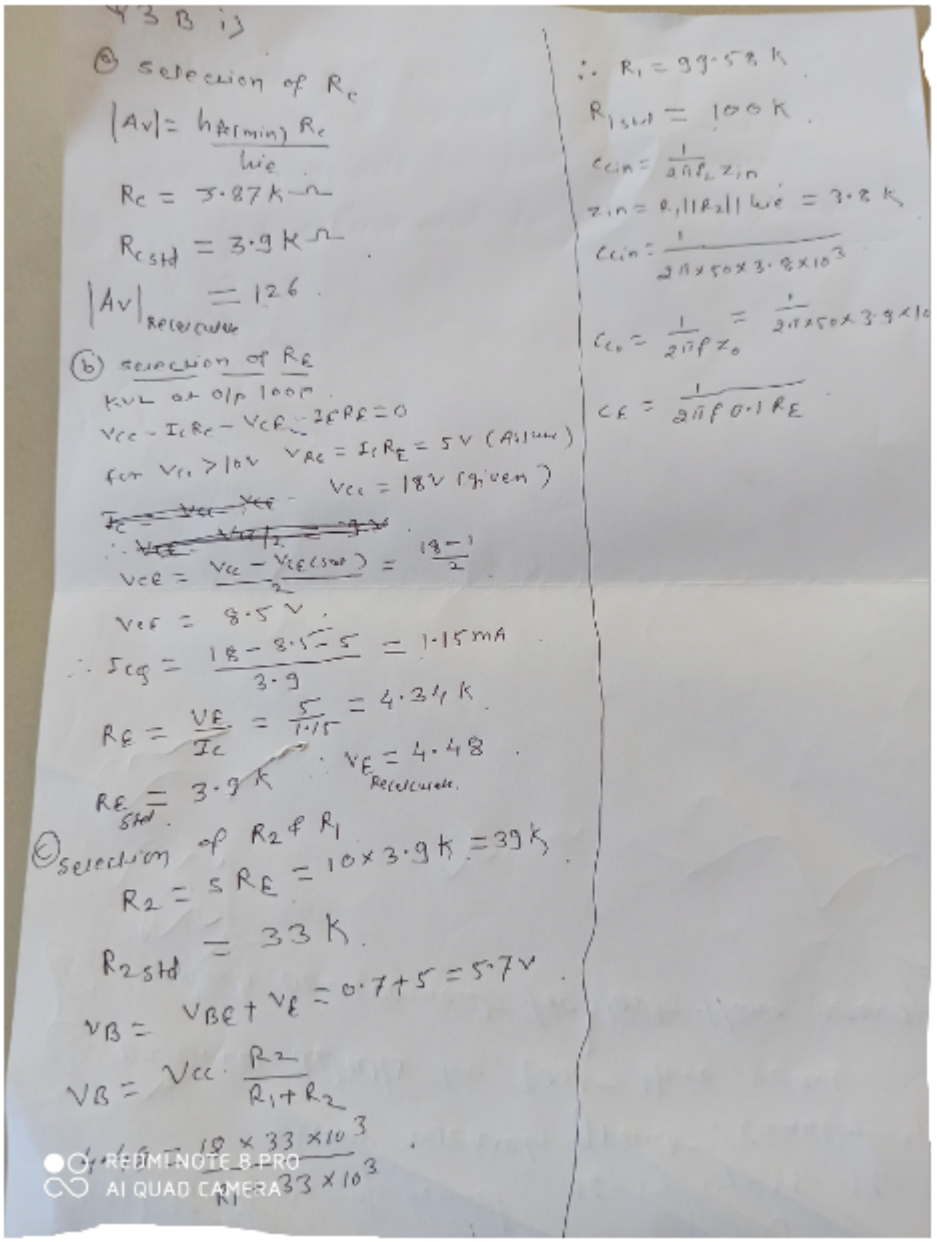
$$E_{Th} = IR_2 - V_{EE} = -11.53\,V$$

$$I_B = \frac{V_{EE} - V_{Th} - V_{BE}}{R_{Th} + (1+\beta)R_E} = 35.39\,\mu A$$

$$I_C = 4.25\,mA$$

$$V_C = V_{CC} - I_C R_C = 8.53\,V$$

$$V_B = -V_{Th} - I_B R_{Th} = -11.57\,V$$


43 B ii)
(a) selection of R_c
$|A_v| = \frac{h_{fe(min)} R_c}{h_{ie}}$
$R_c = 3.87\,K\Omega$
$R_{c\,std} = 3.9\,K\Omega$
$|A_v|_{Recalculate} = 126$
(b) selection of R_E
KVL at o/p loop
$V_{cc} - I_c R_c - V_{CE} - I_E R_E = 0$
for $V_{i1} > 10V$ $V_{RE} = I_1 R_E = 5V$ (Assume)
$V_{cc} = 18V$ (given)
$V_{CE} = \frac{V_{cc} - V_{E(std)}}{2} = \frac{18-1}{2}$
$V_{CE} = 8.5\,V$
$I_{CQ} = \frac{18 - 8.5 - 5}{3.9} = 1.15\,mA$
$R_E = \frac{V_E}{I_C} = \frac{5}{1.15} = 4.34\,K$
$R_{E\,std} = 3.9\,K$
$V_{E\,Recalculate} = 4.48$
(c) selection of R_2 & R_1
$R_2 = 5 R_E = 10 \times 3.9\,K = 39\,K$
$R_{2\,std} = 33\,K$
$V_B = V_{BE} + V_E = 0.7 + 5 = 5.7V$
$V_B = V_{cc} \cdot \frac{R_2}{R_1 + R_2}$
$R_1 = \frac{18 \times 33 \times 10^3}{5.7} - 33 \times 10^3$
$\therefore R_1 = 99.53\,K$
$R_{1\,std} = 100\,K$
$C_{cin} = \frac{1}{2\pi f_L z_{in}}$
$z_{in} = R_1 \| R_2 \| h_{ie} = 3.8\,K$
$C_{cin} = \frac{1}{2\pi \times 50 \times 3.8 \times 10^3}$
$C_{co} = \frac{1}{2\pi f z_o} = \frac{1}{2\pi \times 50 \times 3.9 \times 10}$
$C_E = \frac{1}{2\pi f 0.1 R_E}$
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University of Mumbai

Examination 2020 under Cluster 06

(Lead College: Vidyavardhini's College of Engg Tech)

Examination Commencing from 7th January 2021 to 20th January 2021

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: SE Semester III

Course Code: ELX303 and Course Name: Digital Circuit Design

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 are the universal gates?
Option A:	OR
Option B:	NOT
Option C:	AND
Option D:	NAND & NOR
2.	Binary codes of decimal no $(100)_{10}$ is
Option A:	1100101
Option B:	1100 111
Option C:	1100100
Option D:	1101100
3.	For logical expression Y=ab+ bc +ac how many AND gates and OR gates required
Option A:	AND GATE=3,OR GATE=1
Option B:	AND GATE=2,OR GATE=1
Option C:	AND GATE=2,OR GATE=2
Option D:	AND GATE=2,OR GATE=4
4.	Binary representation of gray no. 10110 is
Option A:	11011
Option B:	11001
Option C:	11010
Option D:	10110
5.	Which of the following statements accurately represents the two BEST methods of logic circuit simplification?
Option A:	Actual circuit trial and error evaluation and waveform analysis
Option B:	Karnaugh mapping and circuit waveform analysis
Option C:	Boolean algebra and Karnaugh mapping
Option D:	Boolean algebra and actual circuit trial and error evaluation
6.	The logic family which has highest noise margin is _____
Option A:	TTL
Option B:	ECL

Option C:	MOS
Option D:	CMOS
7.	To realize Half adder the gates required are _____
Option A:	One AND gate and one EX-OR gate
Option B:	One NAND gate and one EX-OR gate
Option C:	One OR gate and one EX-NOR gate
Option D:	One NOR gate and one EX-NOR gate
8.	A multiplexer with 4 select lines is a _____
Option A:	4:1 multiplexer
Option B:	8:1 multiplexer
Option C:	16:1 multiplexer
Option D:	32:1 multiplexer
9.	To realize full subtractor using active low decoder we need _____
Option A:	One 1:8 active low decoder and two NAND gates with 4 inputs.
Option B:	Two 1:8 active low decoder and two NAND gates with 4 inputs.
Option C:	Two 1:4 active low decoder and two OR gates with 4 inputs.
Option D:	One 1:8 active low decoder and two OR gates with 4 inputs.
10.	Data 1101 is to be transmitted for even parity, what will be 7-bit hamming code format?
Option A:	1100110
Option B:	1011110
Option C:	1010101
Option D:	1011100
11.	If clock frequency of mod 16 up ripple counter is 2KHz then the square wave available from MSB flip flop will be _____
Option A:	1KHz
Option B:	500Hz
Option C:	250Hz
Option D:	125Hz
12.	Number of NAND gates required to realize OR gate are _____
Option A:	2
Option B:	3
Option C:	4
Option D:	5
13.	Convert JK flip-flop to Toggle switch the condition is _____
Option A:	J=0, K=0
Option B:	J=1, K=1
Option C:	J=0, K=1
Option D:	J=1, K=0
14.	The characteristic equation of a T flip flop is

Option A:	QN+1=QN
Option B:	QN+1=T QN'+T'QN
Option C:	QN+1=QN'
Option D:	QN+1=T'QN'+QNT
15.	Find the correct statement related to Reset, Preset pins of JKMS flip flop IC 7476.
Option A:	Both are active low
Option B:	Both are active high
Option C:	Reset is active low and Preset is active high
Option D:	Reset is active high and Preset is active low
16.	TTL logic family gives inbuilt Noise margin of
Option A:	0.2V
Option B:	0.1V
Option C:	0.5V
Option D:	0.4V
17.	The number of D Flip-Flops required for mod 10 Johnson counter are ____
Option A:	4
Option B:	5
Option C:	6
Option D:	10
18.	The minimum number of flip flops required for mod 12 ripple counter is ____
Option A:	3
Option B:	4
Option C:	6
Option D:	12
19.	Which IC used for 8 to 1 multiplexer
Option A:	74158
Option B:	74151
Option C:	7474
Option D:	74154
20.	Ring shift and twisted ring counters are _____
Option A:	Synchronous counters
Option B:	Asynchronous counters
Option C:	True binary counters
Option D:	Synchronous and true binary counters

Q2 (20 Marks)	

A	**Solve any Two 5 marks each**
i.	Convert T flip flop to JK flip flop
ii.	Design FULL ADDER USING 8:1 MUX
iii.	Add the BCD numbers code from: $(27+34)_{BCD}$ and $(85+64)_{BCD}$
B	**Solve any One 10 marks each**
i.	Design 3 bit asynchronous counter using T flip-flop
ii.	Implement the expression using K-Map for the function F(A,B,C,D) = ∑m(0,1,2,4,5,8,9,15)

Q3. (20 Marks)	
A	**Solve any Two 5 marks each**
i.	Draw and explain the circuit diagram of 2-input CMOS INVERTER gate.
ii.	Explain static and dynamic hazards
iii.	Explain race-around condition in JK Flip-Flop
B	**Solve any One 10 marks each**
i.	Simplify 4 variable Boolean function using Quine-McClusky technique F(A,B,C,D) = ∑m(0,1,2,3,8,9,12,13)
ii.	Design 2-bit UP/DOWN counter using JK Flip-Flop

University of Mumbai
Examination 2020 under Cluster 06
(Lead College: Vidyavardhini's College of Engg Tech)

Examination Commencing from 7th January 2021 to 20th January 2021

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: SE Semester III

Course Code: ELX303 and Course Name: Digital Circuit Design

Time: 2 hour Max. Marks: 80

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Q1:

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

Important steps and final answer for the questions involving numerical example

Q.2 (A): (i) T=SR'Qn'+S'RQn ; (iii): $(1241)_{bcd}$,$(111)_{bcd}$ B) (ii)B'C+AD'+B'D'

Q.3 (B)(i) F= A'C + B'D' + AC'D

University of Mumbai

Examination 2020 under Cluster 06

(Lead College: Vidyavardhini's College of Engg Tech)

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: **Electronics Engineering**

Curriculum Scheme: **Rev 2016**

Examination: **SE Semester III**

Course Code: **ELX304** and Course Name: **Electrical Network Analysis & Synthesis**

Time: 2-hour Max. Marks: 80

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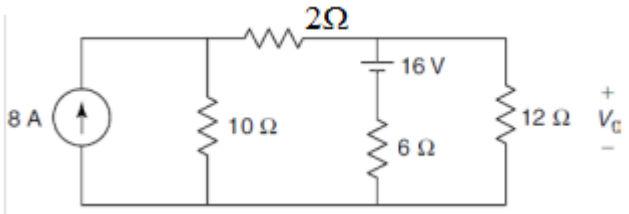
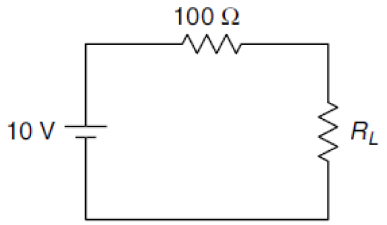
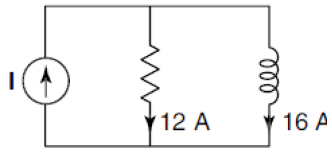
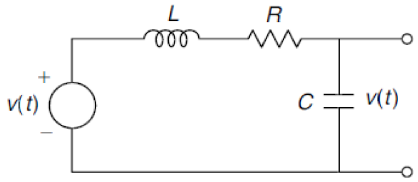
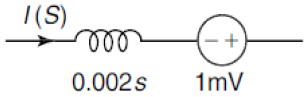
Note:

1. All Questions are compulsory and carry equal marks.

2. Assume suitable data wherever necessary.

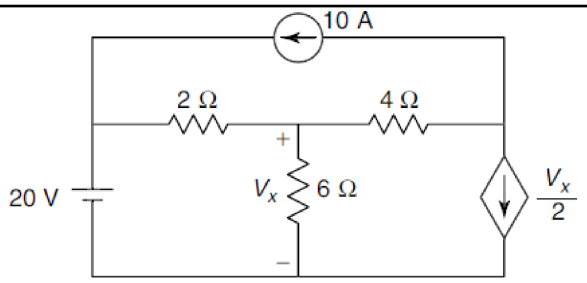
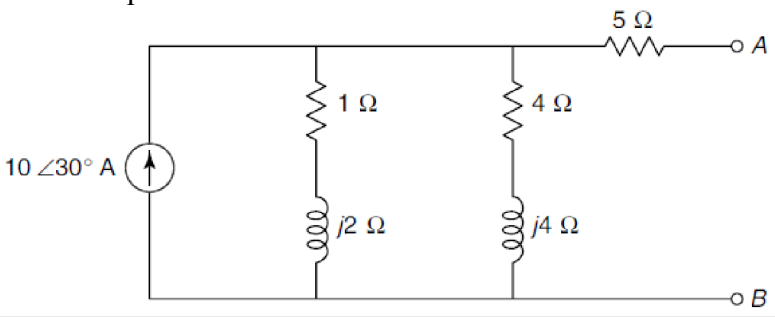
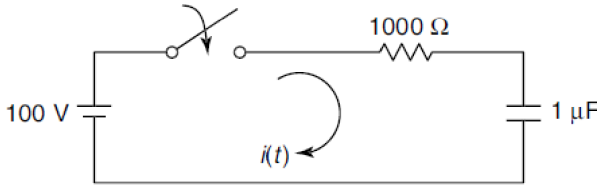
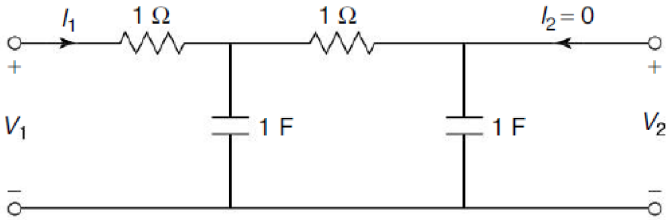
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	A network contains linear resistors and ideal voltage sources. If values of all the resistors are doubled then the voltage across each resistor is
Option A:	Halved
Option B:	Doubled
Option C:	increased by four times
Option D:	decreased by four times
2.	Find the voltage V_0 
Option A:	48 V
Option B:	24 V
Option C:	36 V
Option D:	28 V
3.	Superposition theorem is not applicable to networks containing
Option A:	nonlinear elements
Option B:	dependent voltage source
Option C:	dependent current source
Option D:	transformers
4.	What will be the maximum power that can be transferred to the load R_L from the voltage source

	
Option A:	1 W
Option B:	10 W
Option C:	0.25 W
Option D:	0.5 W
5.	In a series RLC circuit, $V_R = 3$ V, $V_L = 14$ V, $V_C = 10$ V. The input voltage to the circuit is
Option A:	10 V
Option B:	5 V
Option C:	27 V
Option D:	24 V
6.	Obtain the current supplied by the sinusoidal current source I is 
Option A:	28 A
Option B:	4 A
Option C:	20 A
Option D:	24A
7.	The condition on R, L and C such that the step response v(t) in Figure has no oscillations is 
Option A:	$R \geq \frac{1}{2}\sqrt{\frac{L}{C}}$
Option B:	$R \geq \sqrt{\frac{L}{C}}$
Option C:	$R \geq 2\sqrt{\frac{L}{C}}$
Option D:	$R = \frac{1}{\sqrt{LC}}$
8.	A step function voltage is applied to an RLC series circuit having R = 2 Ω, L = 1 H and C = 1 F. The transient current response of the circuit would be
Option A:	over damped

Option B:	critically damped
Option C:	under damped
Option D:	overdamped as well as underdamped
9.	A 2 mH inductor with some initial current can be represented as shown in figure,  What will be the value of the initial current is
Option A:	0.5 A
Option B:	2 A
Option C:	1 A
Option D:	0
10.	For synthesizing the transfer function in Pole-Zero Plot, if degree of Numerator is not equal to degree of Denominator than
Option A:	we add a pole/zero towards infinity in LHS of s-plane
Option B:	we add a pole/zero towards infinity in RHS of s-plane
Option C:	we add a pole/zero towards infinity in LHS & RHS of s-plane
Option D:	we add a pole/zero towards Zero in LHS of s-plane
11.	If all the poles & zeros are lying on negative s-plane (LHS of s-plane) than, the transfer function is
Option A:	Perfectly Stable
Option B:	Unstable
Option C:	Marginally Stable
Option D:	Infinite
12.	As the poles of a network shift away from the x axis, the response
Option A:	remains constant
Option B:	becomes less oscillating
Option C:	becomes more oscillating
Option D:	never oscillating
13.	Two two-port networks are connected in cascade. The combination is to be represented as a single two-port network. The parameters are obtained by multiplying the individual
Option A:	z-parameter matrix
Option B:	h-parameter matrix
Option C:	y-parameter matrix
Option D:	ABCD parameter matrix
14.	For a two-port network to be reciprocal
Option A:	$z_{11} = z_{22}$
Option B:	$y_{21} = y_{12}$
Option C:	$h_{21} = -h_{12}$
Option D:	$AD - BC = 0$

15.	A two-port network is defined by the following pair of equations $I_1 = 2V_1 + V_2$ and $I_2 = V_1 + V_2$. Its impedance parameters $(Z_{11}, Z_{12}, Z_{21}, Z_{22})$ are given by
Option A:	2, 1, 1, 1
Option B:	1, −1, −1, 2
Option C:	1, 1, 1, 2
Option D:	2, −1, −1, 1
16.	If P(S) = P1(S) * P2(S) than, P(S) is said to be Hurwitz Polynomial, if
Option A:	P1(S) is Hurwitz Polynomial
Option B:	P2(S) is Hurwitz Polynomial
Option C:	P1(S) is Hurwitz Polynomial & P2(S) is not a Hurwitz Polynomial
Option D:	P1(S) & P2(S) both are Hurwitz Polynomial
17.	To realize the Foster form of Impedance Function Z(S)
Option A:	The degree of numerator > The degree of denominator
Option B:	The degree of numerator < The degree of denominator
Option C:	The degree of numerator = The degree of denominator
Option D:	The degree of numerator ≤ The degree of denominator
18.	The Cauer - II form is obtained by
Option A:	Continued Fraction Expansion about the pole at infinity
Option B:	Partial Fraction Expansion of the admittance function Y(S)
Option C:	Continued Fraction Expansion about the pole at origin
Option D:	Partial Fraction Expansion of the impedance function Z(S)
19.	The attenuation constant α decreases gradually to zero at the cut-off frequency and remains at _____ through the pass band
Option A:	zero
Option B:	π
Option C:	-π
Option D:	1
20.	In an m-derived low-pass filter, the value of m is
Option A:	$\sqrt{1-\left(\frac{f_\infty}{f_c}\right)^2}$
Option B:	$\sqrt{1-\left(\frac{f_c}{f_\infty}\right)^2}$
Option C:	$\sqrt{1+\left(\frac{f_\infty}{f_c}\right)^2}$
Option D:	$\sqrt{1+\left(\frac{f_c}{f_\infty}\right)^2}$

Q2.	**Solve any Two Questions out of Three 10 marks each (20 Marks)**

A	Find the voltage V_x . 
B	Obtain Norton's equivalent network at the terminals A and B. 
C	$find\ value\ for\ i, \frac{di}{dt}\ and\ \frac{d^2i}{dt^2}\ at\ t = 0^+.$ The switch is closed at t = 0. With the capacitor uncharged. 
Q3.	**Solve any Two Questions out of Three 10 marks each (20 Marks)**
A	Determine transfer function V_2/V_1 and V_1/I_1 
B	Derive the inter-relationships of Z parameters in terms of Y-Parameters and ABCD parameters.
C	Test whether the following functions are Positive Real Function or Not (i) $F(s) = \frac{s^2+4}{s^3+3s^2+3s+1}$ (ii) $F(s) = \frac{s^4+3s^3+s^2+s+2}{s^3+s^2+s+1}$

University of Mumbai
Examination 2020 under Cluster 06
(Lead College: Vidyavardhini's College of Engg Tech)

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: **Electronics Engineering**

Curriculum Scheme: **Rev 2016**

Examination: **SE Semester III**

Course Code: **ELX304** and Course Name: **Electrical Network Analysis & Synthesis**

Time: 2-hour Max. Marks: 80

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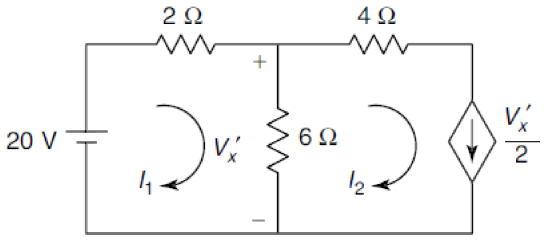
Q1: Answer Key

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

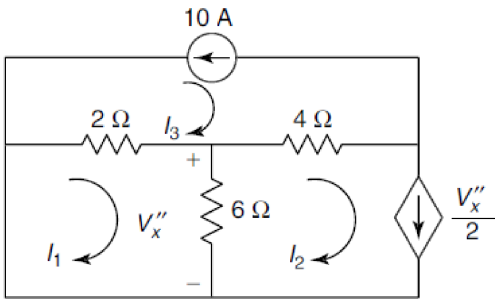
Important steps and final answer for the questions involving numerical example

Q2(A): Step I:- When the 20 V source is acting alone



$$V_x' = 6(I_1 - I_2) = 6(5.71 - 4.29) = 8.52 \text{ V}$$

Step II:- When the 10 A source is acting alone



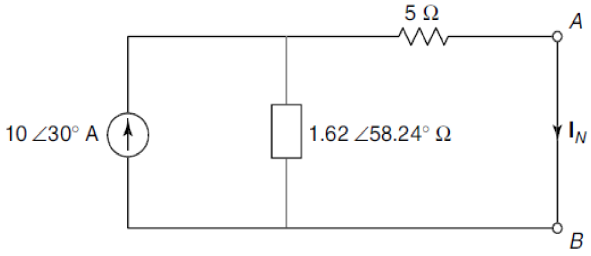
$$V_x'' = 6(I_1 - I_2) = 6(-5.71 + 4.29) = -8.52 \text{ V}$$

Step III:- By superposition theorem,

$$V_x = V_x' + V_x'' = 8.52 - 8.52 = 0$$

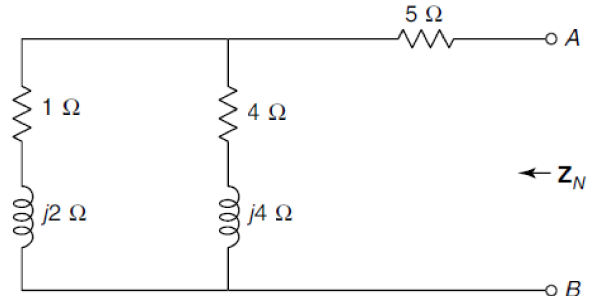
Q. 2(B)

Step I: Calculation of I_N



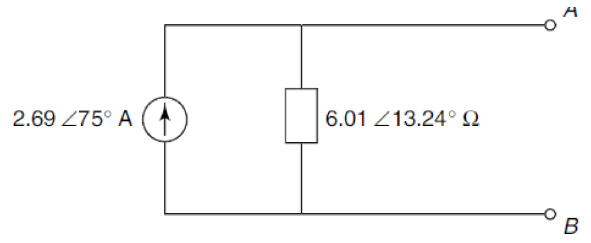
$$\mathbf{I}_N = (10\angle 30^\circ)\left(\frac{1.62\angle 58.24^\circ}{1.62\angle 58.24^\circ + 5}\right) = 2.69\angle 75^\circ \text{ A}$$

Step II: Calculation of Z_N



$$\mathbf{Z}_N = 5 + \frac{(1+j2)(4+j4)}{1+j2+4+j4} = 6.01\angle 13.24^\circ\ \Omega$$

Step III: Norton's Equivalent Network

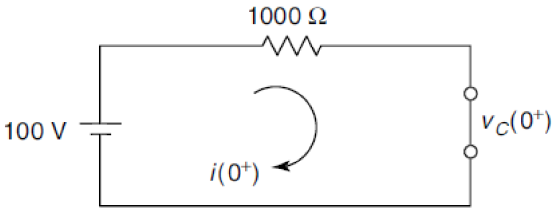


Q.2 (C)

At $t = 0^+$, the capacitor acts as a short circuit.

$$v_C(0^+) = 0$$

$$i(0^+) = \frac{100}{1000} = 0.1 \text{ A}$$



Writing the KVL equation for $t > 0$,

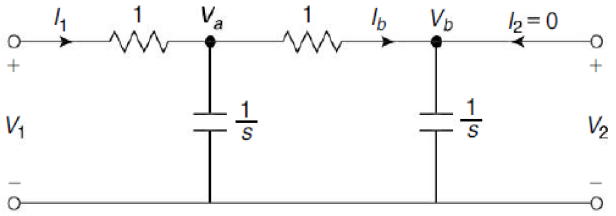
At $t = 0^+$,

$$\frac{di}{dt}(0^+) = -\frac{10^6}{1000} i(0^+) = -\frac{10^6}{1000}(0.1) = -100 \text{ A/s}$$

Differentiating, At $t = 0^+$

$$\frac{d^2 i}{dt^2}(0^+) = -\frac{10^6}{1000}\frac{di}{dt}(0^+) = -\frac{10^6}{1000}(-100) = 10^5 \text{ A/s}^2$$

Q3. (A)



$$V_b = V_2$$

$$I_b = \frac{V_2}{\frac{1}{s}} = sV_2$$

$$V_a = 1I_b + V_2$$
$$= sV_2 + V_2 = (s+1)V_2$$

$$I_1 = \frac{V_a}{\frac{1}{s}} + I_b = sV_a + I_b = s(s+1)V_2 + sV_2 = (s^2+2s)V_2$$

$$V_1 = 1I_1 + V_a = (s^2+2s)V_2 + (s+1)V_2 = (s^2+3s+1)V_2$$

$$\frac{V_2}{V_1} = \frac{1}{s^2+3s+1}$$

$V_1/I_1=\{s^2+3s+1\}/s(s+2)$

Q. 3. (C)

(i) The function F(s) has two zeros at s = ± j2 and three poles at s = −1. Thus, all the poles and zeros are in the left half of the s plane. There is no pole on the jw axis. Hence, the residue test is not carried out.

Even part of $N(s) = m_1 = s^2 + 4$

Odd part of $N(s) = n_1 = 0$

Even part of $D(s) = m_2 = 3s^2 + 1$

Odd part of $D(s) = n_2 = s^3 + 3s$

$$A(\omega^2) = m_1 m_2 - n_1 n_2 \big|_{s=j\omega} = (s^2+4)(3s^2+1) - (0)(s^3+3s)\big|_{s=j\omega} = 3s^4 + 13s^2 + 4\big|_{s=j\omega} = 3\omega^4 - 13\omega^2 + 4$$

For $\omega = 1$, $A(\omega)^2 = 3 - 13 + 4 = -6$

This condition is not satisfied.

Hence, the function **F(s)** is **not positive real**.

(ii)

$$F(s) = \frac{N(s)}{D(s)} = \frac{s^4 + 3s^3 + s^2 + s + 2}{s^3 + s^2 + s + 1}$$

N(s) and D(s) are Hurwitz

By Routh array,

s^4	1	1	2
s^3	3	1	
s^2	$\frac{2}{3}$	2	
s^1	−8		
s^0	2		

Since there is a sign change in the first column of the array, N(s) is not Hurwitz. Thus, all the zeros are not in the left half of the s plane. The remaining two tests need not be carried out.

Hence, the function **F(s) is not positive real**.

University of Mumbai
Examination 2020 under Cluster 06
(Lead College: Vidyavardhini's College of Engg Tech)

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: SE Semester III

Course Code: ELX305 and Course Name: Electronics Instruments and Measurement

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 error can arise as a result of mistake in reading , parallax, improper instrument location and inadequate lighting
Option A:	Construction error
Option B:	Transmission Error
Option C:	Observation Error
Option D:	Translation Error
2.	Which of the following is static characteristic?
Option A:	Speed of response
Option B:	Fidelity
Option C:	Lag
Option D:	Resolution
3.	The degree to which sensor characteristics remain constant over time is
Option A:	Sensitivity
Option B:	Linearity
Option C:	Stability
Option D:	Inverse sensitivity
4.	A simple bridge circuit consists of a network of
Option A:	2 resistance arms
Option B:	6 resistance arms
Option C:	4 resistance arms
Option D:	3 resistance arms
5.	Which principle operates a bridge circuit?
Option A:	Kirchhoff's laws
Option B:	ampere's rule
Option C:	partial indication
Option D:	null indication
6.	Which of the following bridges is used for measurement of inductance with Quality Factor (Q) higher than 10
Option A:	Anderson Bridge

Option B:	Hay Bridge
Option C:	Maxwell Bridge
Option D:	Kelvin Double Bridge
7.	Which of the following is not part of CRO?
Option A:	Sweep Generator
Option B:	Trigger circuit
Option C:	CRT
Option D:	Bridge Circuit
8.	Control grid is given _____
Option A:	positive voltage
Option B:	negative voltage
Option C:	neutral voltage
Option D:	zero voltage
9.	The sweep generator of a CRO is used to produce
Option A:	Saw tooth voltage for the horizontal deflection of electron beam
Option B:	Sinusoidal voltage for the vertical deflection of electron beam
Option C:	Saw tooth voltage for the vertical deflection of electron beam
Option D:	Sinusoidal voltage for the horizontal deflection of electron beam
10.	If the two input waveforms of equal amplitude and 90 degree phase difference is applied to the CRO then the Lissajous patterns obtained will be
Option A:	Straight line tilted at 45 degree with respect to X-axis
Option B:	Vertical straight line
Option C:	Ellipse
Option D:	Circle
11.	Which of the following is inverting type of DVM?
Option A:	Linear Ramp Type
Option B:	Staircase Ramp Type
Option C:	Successive Approximation Type
Option D:	Duel Slope Integrating Type
12.	Loading effect is principally caused by____ instruments
Option A:	High resistance
Option B:	Low sensitivity
Option C:	High sensitivity
Option D:	High Range
13.	Digital instruments are those which
Option A:	Have numerical readout
Option B:	Use LED or LCD display
Option C:	Have circuitry of digital design
Option D:	Use deflection type meter movement
14.	Self generating type transducers are transducers.
Option A:	Inverse

Option B:	Secondary
Option C:	Passive
Option D:	Active
15.	LVDT which is an instrument for the measurement of displacement, works on the principal of
Option A:	Mutual inductance
Option B:	Linear inductance
Option C:	Non - linear inductance
Option D:	Linear capacitance
16.	Relation between temperature and resistance of a conductor is _____
Option A:	$R_t = R_{ref}[1+t]$
Option B:	$R_t = R_{ref}[1+\alpha\Delta t]$
Option C:	$R_t = R_{ref}[1-\alpha t]$
Option D:	$R_t = R_{ref}[1-t]$
17.	A thermocouple consists of
Option A:	2 wires
Option B:	1 wire
Option C:	4 wire
Option D:	3 wire
18.	The ionization gauge an instrument used for the measurement of
Option A:	Medium pressure
Option B:	High pressure
Option C:	Very high pressure
Option D:	Very low pressure
19.	Which of the following is not a type of pressure sensing element?
Option A:	Bellows
Option B:	Bourdon tube
Option C:	Orifice plate
Option D:	Diaphragm
20.	Turbine meters are generally preferred for
Option A:	High viscosity and low flow measurements
Option B:	High viscosity and high flow measurements
Option C:	Low viscosity and low flow measurements
Option D:	Low-viscosity and high flow measurements

Q2	**Solve any Four out of Six** **5 marks each**
A	Define and Explain 1) Sensitivity 2) Precision
B	Write difference between Maxwell's and Hay's Bridge
C	Explain the function of delay line in CRO with diagram
D	With a neat diagram, explain the principle of digital time measurement
E	Define transducers and explain the selection criteria of transducers

F	Draw the detailed diagram of Mcleod gauge

Q3.	**Solve any Four out of Six** **5 marks each**
A	Explain the different types of errors
B	Draw the neat labelled diagram of LCR Q meter and explain its operating principle
C	Draw a block diagram of CRO and explain electron gun assembly
D	Describe the digital frequency meter along with the diagram
E	Write a short note on LVDT
F	Write a short note of rotameter

University of Mumbai
Examination 2020 under Cluster 06
(Lead College: Vidyavardhini's College of Engg Tech)

Examination Commencing from 7th January 2021 to 20th January 2021

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: SE Semester III

Course Code: ELX305 and Course Name: Electronic Instruments and Measurements

Time: 2 hour Max. Marks: 80

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Q1:

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