TN TRB
Asst Prof.

Previous Year Paper
(Electrical Engineering)
05 Apr, 2025

TRB TN AU

Module Name : Electrical Engineering
Exam Date : 05-Apr-2025 Batch : 14:00-17:30

Sr. No.	Electrical Engineering	Marks
	PAPER I	
1	பூத்தொடுத்தல் – என்பது எவ்வகை புணர்ச்சி ? A குற்றியலுகரப் புணர்ச்சி B குற்றியலிகரப் புணர்ச்சி ✓ C உயிரீறு புணர்ச்சி D மெய்யீற்றுப் புணர்ச்சி	2.0
2	ஆண்பாற் பிள்ளைத் தமிழுக்குப் – பொருந்தாத பருவத்தைத் தேர்வு செய்க. A சிற்றில் B சிறுபறை ✓ C அம்மானை D சிறுதேர்	2.0
3	இலக்கணக் குறிப்பு தருக. “நெடுந்திரை” A வினைத் தொகை B உம்மைத் தொகை ✓ C பண்புத் தொகை D உவமைத் தொகை	2.0
4	“பயில்தொழில்” என்ற சொல்லுக்கு இலக்கணக் குறிப்பு தருக. A எண்ணும்மை B உரிச்சொற்றொடர் ✓ C வினைத் தொகை D பண்புத் தொகை	2.0
5	சந்திப்பிழை இல்லாத தொடரைக் கண்டறிக. A அறிவு தேடலில் உடல், உள்ளத் தடைகளைத் தகர்த்த மாமேதை ஸ்டீபன் ஹாக்கிங் B அறிவுத் தேடலில் உடல், உள்ள தடைகளைத் தகர்த்த மாமேதை ஸ்டீபன் ஹாக்கிங் ✓ C அறிவுத் தேடலில் உடல், உள்ளத் தடைகளைத் தகர்த்த மாமேதை ஸ்டீபன் ஹாக்கிங்.	2.0

	D அறிவுத் தேடலில் உடல், உள்ளத் தடைகளை தகர்த்த மாமேதை ஸ்டீபன் ஹாக்கிங்.	
6	பனியொடு – பொருத்தமான புணர்ச்சி விதியைக் கண்டறிக. A 'உயிர்வரின் உக்குறள் மெய்விட்டோடும், உடல்மேல் உயிர் வந்தொன்றுவதியல்பே." ✓B "இஈஐ வழி யவ்வும், உடல் மேல் உயிர் வந்தொன்றுவதியல்பே" C "இனமிகல், தனிக்குறில் முன் ஒற்று உயிர் வரின் இரட்டும்" D "ஈறுபோதல், தன்னொற்றிரட்டல்."	2.0
7	சொல்லையும், பொருளையும் பொருத்துக : (1) ஊழி (அ) மழை (2) ஊழ் (ஆ) யுகம் (3) பெயல் (இ) குளிர்ந்த (4) தண் (ஈ) முறை A (1)-(ஈ), (2)-(ஆ), (3)-(இ), (4)-(அ) B (1)-(இ), (2)-(ஈ), (3)-(ஆ), (4)-(அ) ✓C (1)-(ஆ), (2)-(ஈ), (3)-(அ), (4)-(இ) D (1)-(ஆ), (2)-(அ), (3)-(ஈ), (4)-(இ)	2.0
8	"என் அப்பன் வந்தான்" என்று மாட்டைப் பார்த்துக் கூறுவது எவ்வகை வழுவமைதி? A பால் வழுவமைதி B மரபு வழுவமைதி C இட வழுவமைதி ✓D திணை வழுவமைதி	2.0
9	"கத்துங் குயிலோசை – சற்றேவந்து காதிற் படவேணும் – என்ற பாரதியார் பாடலில் அமைந்துள்ள வழுவமைதி எது ? A கால வழுவமைதி ✓B மரபு வழுவமைதி C பால் வழுவமைதி D திணை வழுவமைதி	2.0
10	"உயிர்வரின் உக்குறள் மெய்விட்டோடும் உடல்மேல் உயிர்வந்தொன்றுவதியல்பே" – இவ்விதிகளால் புணர்க்கப்படும் சொல் யாது ? A கீழிருக்கும் ✓B ஈர்ப்பெல்லை C தசையசைவு	2.0

	D பழங்கவிதை	
11	நெடுந்தேர், பெய்மழை–இலக்கணக் குறிப்பைத் தேர்ந்தெடுக்கவும் : A பண்புத் தொகை, உவமைத் தொகை B வினைத் தொகை, உம்மைத் தொகை C இருபெயரொட்டுப் பண்புத் தொகை, வினைத் தொகை ✓D பண்புத் தொகை, வினைத் தொகை	2.0
12	கீழ்க்கண்டவற்றுள் சரியான கூற்றைத் தெரிவு செய்க. (அ) இதழியலில், செயற்கை நுண்ணறிவு குறிப்பிடத்தகுந்த மாறுதல்களைச் செய்து வருகிறது. (ஆ) செயற்கை நுண்ணறிவு பொதிந்த இயந்திரங்களுக்கு ஓய்வு தேவை. (இ) மனிதனால் முடியும் செயல்களையும் அவன் கடினம் என்று கருதும் செயல்களையும் செய்யக்கூடியது செயற்கை நுண்ணறிவு (ஈ) செயற்கை நுண்ணறிவின் மிகுதியான வளர்ச்சியால் தரவு அறிவியலாளர்கள் தேவைப்படமாட்டார்கள். A (அ), (ஆ) சரி, (இ), (ஈ) தவறு ✓B (அ), (இ) சரி, (ஆ), (ஈ) தவறு C (அ), (ஈ) சரி, (அ), (இ) தவறு D (அ), (ஈ) சரி, (ஆ), (இ) தவறு	2.0
13	வாளால் அறுத்துச் சுடினும் மருத்துவன் பால் மாளாத காதல் நோயாளன் போல் – இப்பாடலில் அறிவியலை வாழ்வியலோடு இணைத்துப் பாடியவர் : A பெரியாழ்வார் B ஆண்டாள் ✓C குலசேகராழ்வார் D நம்மாழ்வார்	2.0
14	உயர்திணைக்குரிய பால் பகுப்புகள் எத்தனை ? A இரண்டு B நான்கு C ஐந்து ✓D மூன்று	2.0
15	சரியான மயங்கொலித் தொடரைக் கண்டறிக. (அ) இதழியலில், செயற்கை நுண்ணறிவு குறிப்பிடத்தகுந்த மாருதல்களைச் செய்து வறுகிறது. (ஆ) இதழியலில், செயற்கை நுண்ணறிவு குரிப்பிடத்தகுந்த மாருதல்களைக் செய்துவருகிறது. (இ) இதழியலில், செயற்க்கை நுண்ணறிவு குறிப்பிடத்தகுந்த மாருதல்களைச் செய்து வருகிறது (ஈ) இதழியலில், செயற்கை நுண்ணறிவு குறிப்பிடத்தகுந்த மாறுதல்களைச் செய்துவருகிறது. ✓A (ஈ) B (இ)	2.0

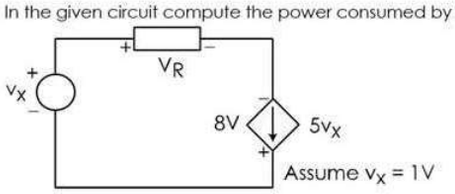
	C (ஆ) D (அ)	
16	புறா, யானை, மலை, பசுக்கள் முறையே எவ்வகைப் பாலினைக் குறிக்கும் : A உயர்திணை பன்மை, அஃறிணை பலவின்பால் B அஃறிணை பலவின்பால், அஃறிணை ஒன்றன்பால் C உயர்திணை ஒன்றன்பால், அஃறிணை ஒன்றன்பால் ✓ D அஃறிணை ஒன்றன்பால், அஃறிணை பலவின்பால்	2.0
17	'பனியொடு' என்ற சொல்லிற்கான புணர்ச்சி விதியைக் கண்டறிக. A உயிரீற்றுப் புணர்ச்சி B பண்புப்பெயர் புணர்ச்சி ✓ C உடம்படு மெய்ப்புணர்ச்சி D பூப் பெயர் புணர்ச்சி	2.0
18	"மாளாத காதல் நோயாளன் போல் மாயத்தால் மீளாத் துயர்தரினும் வித்துவக் கோட்டம்மா! நீ" –இவ்வடிகளில் பயின்று வரும் நயங்களை எழுதுக. A அடிமோனை, இயைபு, முரண் B சீர் மோனை, முரண், சீரெதுகை ✓ C சீர்மோனை, அடியெதுகை D அடிமோனை, அடியெதுகை	2.0
19	'செந்தீ' – சொல்லுக்குரிய பொருளும் இலக்கணக் குறிப்பும் தருக. A நெருப்புக் கோலாம், வினைமுற்று B செம்மையான பேரண்டம், வினைத்தொகை ✓ C நெருப்புப் பந்து, பண்புத் தொகை D நெருப்புச் சுடர், வினையெச்சம்	2.0
20	'ஆர்தருபு' என்ற சொல்லின் பொருள் : ✓ A வெள்ளத்தில் மூழ்கிக் கிடந்த B மண்ணுக்குள் மூழ்கிக் கிடந்த C வெள்ளத்தில் செறிந்து திரண்ட D வெள்ளத்தில் திரண்ட	2.0

21	‘பாய்ச்சல்’ என்னும் சிறுகதை இடம்பெற்றுள்ள சிறுகதைத் தொகுப்பைக் கண்டறிக. A சாயாவனம் B விசாரணை கமிஷன் ✓ C தக்கையின் மீது நான்கு கண்கள் D இவற்றில் ஏதும் இல்லை	1.0
22	பின்வரும் தொகை நிலைத் தொடரை விரித்தெழுதுக : ‘கால தூதர்.’ A காலனின் தூதன் ✓ B காலனுக்குத் தூதன் C காலனது தூதன் D காலனாகிய தூதன்	1.0
23	‘நாட்டார் கலைகள்’ எனும் நூலின் ஆசிரியர் : A வல்லிக் கண்ணன் B க.த. திருநாவுக்கரசர் C சா. கந்தசாமி ✓ D சு.கா. பெருமாள்	1.0
24	தனித் தமிழை இனங்கண்டறிக : A சாந்தம் B மரணம் C மனம் ✓ D அகம்	1.0
25	“பண்டி” என்ற சொல்லின் பொருள் யாது ? A தலையுச்சி B கழுத்து C மார்பு ✓ D வயிறு	1.0
26	“வறுமை” – என்ற சொல்லுக்கு எதிர்ச்சொல் தருக. A பெருமை	1.0

	B திண்மை ✓ வளமை D சிறுமை	
27	"கொடுத்தார்" என்ற சொல்லின் வேர்ச்சொல் தருக. ✓ கொடு B கொடுத்தல் C கொடுத்த D கொடுத்து	1.0
28	"அகழ்தல்" – இலக்கணக் குறிப்பு தருக. A வினைத்தொகை B உரிச்சொற்றொடர் C பண்புத்தொகை ✓ தொழிற்பெயர்	1.0
29	"புரவி" – என்ற சொல்லுக்கு உரிய விலங்கு பெயரை எழுதுக. A மான் B புலி C கரடி ✓ குதிரை	1.0
30	செய்க பொருளைச் செறுநர் செருக்கறுக்கும் எஃகதனிற் கூரிய தில். –இக்குறட்பாவில் செறுநர் என்ற சொல் குறிக்கும் மனிதர் யார் ? A நண்பர் ✓ பகைவர் C உறவினர் D அரசர்	1.0
	PAPER II	
1	Let $P_{2\times2}$ be a matrix satisfying $\begin{pmatrix}1&1\\0&1\end{pmatrix} P \begin{pmatrix}1&0\\1&1\end{pmatrix} = \begin{pmatrix}5&2\\4&-1\end{pmatrix}$ Then P is : A $\begin{pmatrix}-2&5\\3&-1\end{pmatrix}$	0.5

	B $\begin{pmatrix} -1 & 5 \\ 3 & -2 \end{pmatrix}$ C ✓ $\begin{pmatrix} -2 & 3 \\ 5 & -1 \end{pmatrix}$ D $\begin{pmatrix} -1 & 3 \\ 5 & -2 \end{pmatrix}$	
2	One of the non-zero eigen value of the matrix $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$ is A 1 B 2 C ✓ 3 D 4	0.5
3	Let $\vec{F}$ be a vector point function. Statement I : If $\vec{F}$ is solenoidal, then $\nabla \times \left(\nabla \times \vec{F} \right) = -\nabla^2 \vec{F}$ Statement II : If $\vec{F}$ is irrotational, then $\nabla \left(\nabla . \vec{F} \right) = \nabla^2 \vec{F}$ Which one of the following statements is correct ? A ✓ Both **statement I** and **statement II** are true B Both **statement I** and **statement II** are false C **Statement I** is true and**statement II** is false D **Statement I** is false and**statement II** is true	0.5
4	If $f(x, y) = x^2 y + y \sin x$, then $\frac{\partial^2 f}{\partial x \, \partial y} - \frac{\partial^2 f}{\partial y \, \partial x}$ is: A ✓ 0 B 2x + cos x C 4x + 2 cos x D - 4x - 2 cosx	0.5
5	The value of least possible positive number λ such that the following problem has a non-trivial solution $y'' + \lambda y = 0, \; 0 < x < 1$ $y'(0) = 0 = y'(1)$ is	0.5

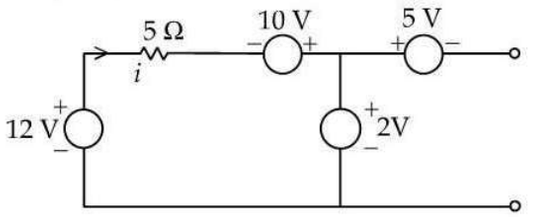
	A $\pi^2/2$ ✓ B π^2 C $\pi^2/3$ D $2\pi^2$	
6	The initial value problem $y' = y^2$, $x \in \mathbf{R}$ $y(0) = 1$ has A Unique solution B Exactly two solutions C Infinitely many solutions ✓ D No solution	0.5
7	Let y be a solution of $(x^2y'') - 2y = 0$ $y(1) = 1$ $y(2) = 1$. Then $y(3)$ is : ✓ A $\frac{11}{7}$ B $\frac{11}{8}$ C $\frac{11}{9}$ D $\frac{11}{10}$	0.5
8	The function $f(z)=x^2-y^2i$ is : A Analytic everywhere B Analytic only at origin C Analytic along the line $y = \pm x$ ✓ D Nowhere analytic	0.5
9	The integral $\oint_C \frac{dz}{z^2+1} = 0$, where: ✓ A C is the circle $\|z\| = 2$	0.5

	B C is the circle $\lvert z-i\rvert=\frac{1}{2}$ C C is the circle $\lvert z+i\rvert=\frac{1}{2}$ D C is the circle $\lvert z-i\rvert=1$	
10	Consider two integrals (i) $I_1=\oint_C e^z dz$ (ii) $I_2=\oint_C \bar{z}\, dz$, where C is the unit circle. Then A $I_1 = I_2 = 0$ because of Cauchy's integral theorem B $I_1 = 0$ and $I_2 \neq 0$ because of Cauchy's integral theorem ✓ C $I_1 = 0$ due to Cauchy's integral theorem D $I_2 = 0$ due to Cauchy's integral theorem	0.5
11	Let x denote the number of heads when two coins are tossed. Then $E\left[(x+1)^2\right]$ is : ✓ A $\frac{9}{2}$ B 4 C 1 D $\frac{3}{2}$	0.5
12	X is normally distributed and the mean of X is 12 and Standard deviation is 4. Then the probability of $\{X \geq 20\}$ is (Given : Area under standard normal probability curve in $0 < z < z_1$ are 0.3413, 0.4772, 0.4987, for z_1=1,2,3 respectively) A 0.9772 B 0.4986 C 0.3413 ✓ D 0.0228	0.5
13	In the given circuit compute the power consumed by the element V_R is :  A 35W B 20W ✓ C 45W	0.5

D 40W

14

Compute the current 'i' in the circuit given below :



A -4.4A

B 4A

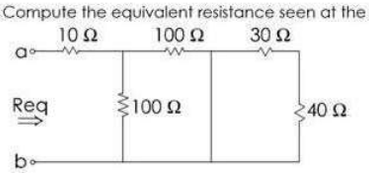
C -4A

D 4.4A

0.5

15

Compute the equivalent resistance seen at the port across 'a' and 'b'.



A 160 Ω

B 70 Ω

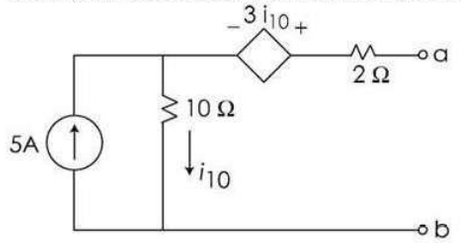
C 110 Ω

D 60 Ω

0.5

16

Compute the value of resistance to be connected across the terminals 'a' and 'b' in the circuit given below, such that maximum power shall be transferred from the circuit.



A 5 Ω

B 9 Ω

C 15 Ω

D 7 Ω

0.5

17

The time domain expression of a 4H inductor excited by a supply of 800 $\angle -50°$ V at a frequency of W=100 rad/s.

A 2 cos (100t + 140°)

0.5

B 2 cos (100t - 40°)

C 200 cos (100t - 140°)

✓ D 2 cos (100t - 140°)

18

Find the average power consumed by an impedance $Z_L = 5 - j\ 10\ \Omega$ by the current $I = 10 \angle 20°$ A.

A 500 W

B 50 W

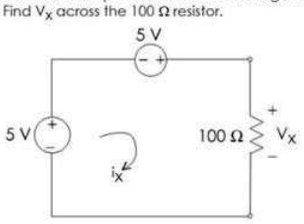
✓ C 250 W

D 100 W

0.5

19

Consider a simple circuit with two voltage sources and a single resistor as shown in figure.
Find V_x across the 100 Ω resistor.



✓ A 10V

B 5V

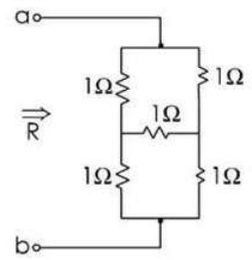
C -10V

D -5V

0.5

20

Compute the equivalent 'R' seen at the terminals 'a' and 'b' for the circuit given below :



A 5 Ω

✓ B 1 Ω

C 1/3 Ω

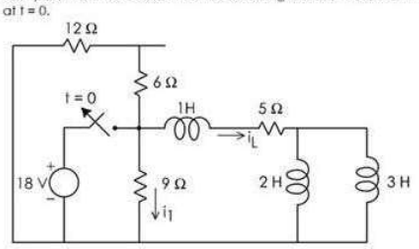
D 2/3 Ω

0.5

21

0.5

Compute the time constant for the following circuit. The switch in the circuit is opened at t = 0.



A 2.2 s

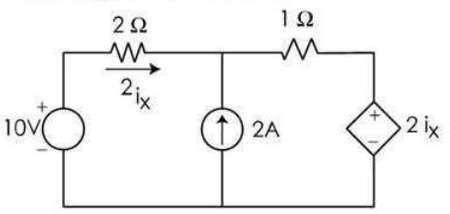
B 20 s

C 2 s

✓ D 0.2 s

22

Compute i_x in the given circuit :



✓ A 1.6 A

B 0A

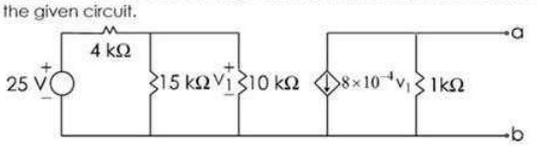
C 4A

D 2A

0.5

23

Compute the Thevenin voltage and Thevenin's resistance across 'a' and 'b' terminals of the given circuit.



A V_{TH} = 8V; R_{TH} = 10 kΩ

✓ B V_{TH} = -12V; R_{TH} = 1kΩ

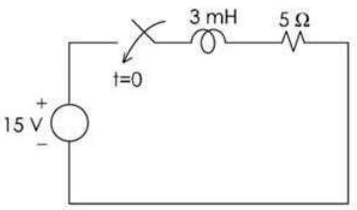
C V_{TH} = 12V; R_{TH} = 10kΩ

D V_{TH} = -8V; R_{TH} = 1kΩ

0.5

24

0.5

	The power dissipated in the inductor is P_L W and the power dissipated in the resistor is P_R W in the given circuit. The switch in the circuit is closed at t = 0 and left closed for infinite time. The power shall be computed after a day.  A P_L = 0W; P_R = 75W B P_L = 9W; P_R = 45W C P_L = 9W; P_R = 0W ✓ D P_L = 0W; P_R = 45W	
25	The divergence of the vector field $\vec{A} = 4x^2y\,\hat{a}_x + 2y^2z^2\,\hat{a}_y + 3y^3\,\hat{a}_z$ at the point (1, 2, 3) is: A 16 B 72 ✓ C 88 D 98	0.5
26	A 0.5μF parallel plate capacitor has plates of area $2m^2$ separated by a dielectric of $\epsilon_R = 250$. What is the distance between the plates of the given capacitor ? ✓ A 8.85 mm B 8.85 μm C 8.85 cm D 8.85 nm	0.5
27	Consider an infinite sheet of charge in yz plane with uniform density of ρ_s C/m^2. The electric field intensity due to this sheet at any point will be directed along the : A y direction B z direction ✓ C x direction D yz plane	0.5
28	Consider the following statements : (I) The magnitude of electric field intensity is given by the maximum value of the rate of change of potential with distance. (II) The direction of electric field is opposite to the direction in which potential is increasing most rapidly. Which of the following is correct ? ✓ A Statement I and II are true	0.5

B Statement I and II are false

C Statement I is true but statement II is false

D Statement II is true but statement I is false

29 Consider an infinitely long straight filament carrying a current of 10 A. The magnetic fileld at a distance of 1 m from the filament in the xy plane would be : 0.5

A $15/\pi\ \hat{a}_\phi$

B $10/\pi\ \hat{a}_\phi$

C $20\pi\ \hat{a}_\phi$

✓ D $5/\pi\ \hat{a}_\phi$

30 The magnetic field intensity at a point in space is given by $\vec{H} = 0.6\ z^2\ \hat{a}_y$. The curl of the magnetic field is : 0.5

A $1.2z\ \hat{a}_x$

B $1.2z\ \hat{a}_y$

✓ C $-1.2z\ \hat{a}_x$

D $-1.2z\ \hat{a}_y$

31 The force on a charge Q moving at a velocity $\vec{v}$ in a magnetic field $\vec{B}$ is given by : 0.5

✓ A $Q\left(\vec{v}\times\vec{B}\right)$

B $Q\left(\vec{v}\cdot\vec{B}\right)$

C $Q\left(\nabla\times\vec{v}\right)$

D $Q\left(\nabla\times\vec{B}\right)$

32 The magnetic susceptibility for a ferrite material for which the relative permeability is 100 will be : 0.5

A 50

B 101

C 99 ✓

D 49

33 The self inductance per unit length of a coaxial cable of inner radius a and outer radius b is given by : 0.5

A ✓ $\frac{\mu_o}{2\pi} \ln\left(\frac{b}{a}\right)$

B $\frac{\mu_o}{2\pi} \ln\left(\frac{a}{b}\right)$

C $\frac{\mu_o}{2} \ln\left(\frac{b}{a}\right)$

D $\frac{\mu_o}{2} \ln\left(\frac{a}{b}\right)$

34 Consider the following statements : 0.5

(i) In an isotropic medium, magnetic flux density is oriented in the same direction as magnetic field intensity

(ii) For steady magnetic fields, $\nabla \times \vec{H} = \vec{J}$

(iii) The magnetic vector potential $\vec{A}$ is related to magnetic field intensity as $\vec{H} = \nabla \times \vec{A}$

Which of the above statements are true ?

A i, ii and iii

B i and ii only ✓

C ii and iii only

D i and iii only

35 A pair of sinusoidal signals with a common angular frequency is defined by 0.5

$x_1[n] = \sin[5\pi n]$

and

$x_2[n] = \sqrt{3}\cos[5\pi n]$

Where both $x_1[n]$ and $x_2[n]$ are periodic. Find their common fundamental period.

A N = 1, 3, 5 …

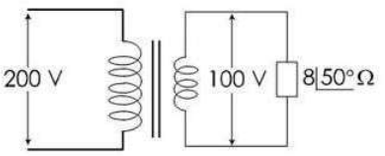
B N = 1, 2, 3, 4, …

	✓ C N = 2, 4, 6, … D N = 0, 1, 2, 3, …	
36	Consider an input x(n) and a unit impulse response h(n) given by x(n) = {1, 2, 3} h(n) = {1, 1} Find y(n). A {1, 2, 3, 1, 1} ✓ B {1, 3, 5, 3} C {2, 3, 2, 3} D {1, 5, 3, 3}	0.5
37	Consider the signal $x[n] = 1 + \sin\frac{2\pi n}{N} + 3\cos\frac{2\pi n}{N} + \cos\left(\frac{4\pi}{N}n + \frac{\pi}{2}\right)$ Find the Fourier series coefficients. ✓ A $a_0 = 1,\ a_1 = \frac{3}{2} - \frac{1}{2}j,\ a_{-1} = \frac{3}{2} + \frac{1}{2}j,\ a_2 = \frac{1}{2}j,\ a_{-2} = \frac{-1}{2}j$ B $a_0 = 1,\ a_1 = \frac{3}{2} + \frac{1}{2}j,\ a_{-1} = \frac{3}{2} - \frac{1}{2}j,\ a_2 = \frac{-1}{2}j,\ a_{-2} = \frac{1}{2}j$ C $a_0 = 1,\ a_1 = 2,\ a_{-1} = 3,\ a_2 = \frac{1}{2},\ a_{-2} = \frac{-1}{2}$ D $a_0 = 0,\ a_1 = 1,\ a_{-1} = 3,\ a_2 = 1,\ a_{-2} = 3$	0.5
38	Consider the signal $x(t) = e^{-at}u(t),\ a > 0$ find $x(j\omega)$ ✓ A $x(j\omega) = \frac{1}{a + j\omega},\ a > 0$ B $x(j\omega) = \frac{1}{a - j\omega},\ a > 0$ C $x(j\omega) = \frac{1}{a + j\omega},\ a < 0$	0.5

	D $x(j\omega) = \frac{1}{a - j\omega}, a < 0$	
39	Find out the Fourier transform x ($e^{j\omega}$) for unit step x [n] = u [n]. A $\frac{1}{1-e^{-j\omega}}$ B 1 C ✓ $\frac{1}{1-e^{-j\omega}} + \pi \sum_{k=-\infty}^{\infty} \delta(\omega - 2\pi k)$ D Fourier transform does not exist for x (n) = u (n)	0.5
40	Consider a causal LTI system that is characterised by the difference equation $y[n] - \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] = 2x[n]$ Determine the impulse response h(n) ? A $h(n) = 2\left(\frac{1}{4}\right)^n u[n] - 4\left(\frac{1}{2}\right)^n u[n]$ B ✓ $h(n) = 4\left(\frac{1}{2}\right)^n u[n] - 2\left(\frac{1}{4}\right)^n u[n]$ C $h(n) = 2\left(\frac{1}{2}\right)^n u(n) - 4\left(\frac{1}{4}\right)^n u(n)$ D $h(n) = 4\left(\frac{1}{4}\right)^n u(n) - 2\left(\frac{1}{2}\right)^n u(n)$	0.5
41	Assume $X(S) = \frac{1}{(S+1)(S+2)}$ Re {S} > −1 Determine inverse Laplace transform. A $[e^{-t} - e^{2t}]\, u(t)$ B $[e^{-t} + e^{-2t}]\, u(t)$ C $[e^{t} + e^{2t}]\, u(t)$	0.5

	D ✓ $\left[e^{-t} - e^{-2t}\right] u(t)$	
42	Find the Laplace transform of $x(t) = te^{-at}u(t)$ A $\frac{1}{(s+a)^n}$, Re {s} < − a B $\frac{1}{(s+a)^n}$, Re {s} = o C ✓ $\frac{1}{(s+a)^n}$, Re {s} > − a D $\frac{1}{(s+a)^{-n}}$, Re {s} = o	0.5
43	Find out the energy of the signal $g(t) = e^{-at} u(t)$, $a > 0$ by using Parseval's theorem. A 2a B $\frac{1}{a}$ C ✓ $\frac{1}{2a}$ D 0	0.5
44	Consider an LTI system given as $y(t) = \int_{-\infty}^{t} x(\tau)\, d\tau$. Determine Y(jω) when $h(t) = u(t)$. A $y(j\omega) = \frac{1}{j\omega} + \pi\,\delta(\omega)$ B $y(j\omega) = \frac{1}{j\omega} \times (j\omega)$ C ✓ $y(j\omega) = \frac{1}{jw} \times (j\omega) + \pi \times (0)\,\delta(\omega)$ D $y(j\omega) = \frac{1}{j\omega}$	0.5

45	In a single phase transformer, the induced emf : A is in phase with the flux B Lags the flux by 90^o ✓C Leads the flux by 90^o D Leads the flux by 180^o	0.5
46	The transformer attains the maximum efficiency when : A Variable loss and constant loss are zero ✓B Variable loss equals to constant loss C Variable loss is maximum D Constant loss is maximum	0.5
47	The short circuit test data for a 20 kVA, 50 Hz, 2000/200 V distribution transformer are as follows SC test with LV — Voltage (V): 60 — Current (A): 10 — Power (W): 300 The resistance and impedance of the transformer referring to its HV side are respectively. A 0.06 Ω and 0.03 Ω B 6 Ω and 3 Ω C 0.03 Ω and 0.06 Ω ✓D 3 Ω and 6 Ω	0.5
48	A 200 V DC shunt generator supplies 4 kW at a terminal voltage of 200V. The armature resistance is 0.5 Ω. The generated voltage is : A 201 V B 200 V C 190 V ✓D 210 V	0.5
49	If the supply frequency of a transformer is doubled, then its eddy current loss : A Remains constant B Decreases 4 times ✓C Increases 4 times D Increases 2 times	0.5
50	The phase angle difference between the voltages of secondary windings in Scott connection of transformers is :	0.5

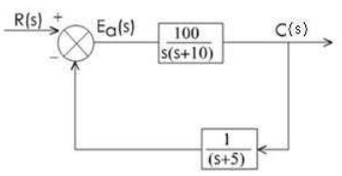
	A ZERO B 180^{o} ✓ C 90^{o} D 120^{o}	
51	The figure shows the connection for an ideal transformer, the value of impedance measured at HV side is :  A $2 \angle 50^{\circ}$ ✓ B $32 \angle 50^{\circ}$ C $4 \angle 50^{\circ}$ D $16 \angle 50^{\circ}$	0.5
52	The speed of the rotor field with respect to stator field in a three-phase induction motor of 4-pole, 50 Hz operating at a slip of 4%. A 60 rpm ✓ B ZERO C 1440 rpm D 1500 rpm	0.5
53	The induced emf of a single-phase, 6kVA, 200V, AC generator with a synchronous reactance of 2 Ω per-phase, when it delivers rated power at 0.8 power factor lagging (neglect armature resistance) is _____. ✓ A 236 V B 248 V C 260 V D 210 V	0.5
54	A 4-pole, Lap connected DC machine has 80 coils in the armature winding. The armature resistance of the machine is 0.4 Ω. The value of armature resistance after rewinding the armature winding as wave winding by retaining the same numbers of armature coils. A 0.4 Ω B 0.2 Ω	0.5

	C 0.8 Ω ✓ B 0.1 Ω	
55	_____ N.m is the torque developed on the armature of a 200V DC series motor driving a fan load at 300 rpm by drawing 20 A current from the supply. The values of armature and field resistance are 0.6 Ω and 0.4 Ω respectively. Assume the external regulator resistance is zero. A (440/π) N.m B (400/π) N.m ✓ C (360/π) N.m D (120/π) N.m	0.5
56	Regarding skewing of motor bars in a squirrel-cage induction motor, which statement is FALSE ? A It prevents cogging ✓ B It increases starting torque C It produces more uniform torque D It reduces motor hum during its operation	0.5
57	When applied rated voltage per phase is reduced by one-half, the starting torque of a squirrel cage induction motor becomes _____ of the starting torque with full voltage. ✓ A $1/4$ B $1/2$ C $\frac{\sqrt{3}}{2}$ D $1/\sqrt{2}$	0.5
58	In a squirrel cage induction motor, the ratio of torque with autostarter to torque with direct switching is : A K B $1/K$ ✓ C K^2 D $1/K^2$	0.5
59	The maximum rotor speed that any synchronous generator with 50 Hz can attain is: A 3600 rpm	0.5

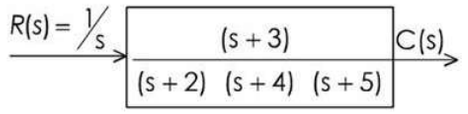
	✓ B 3000 rpm C 1500 rpm D 900 rpm	
60	The armature - leakage reactance drop of a three phase alternator can be determined using : A Synchronous impedance method B Ampere-turn method ✓ C Potier method D Direct loading method	0.5
61	A power system has 10 busses. Out of them 3 busses are PV busses. The number of reactive power constraints formulated in solving power flow solution is _____. A 5 ✓ B 6 C 9 D 36	0.5
62	Four statements are given below : (a) Change in voltage angle at a bus primarily affects the real power flow. (b) Change in voltage magnitude at a bus primarily affects the reactive power flow. (c) Change in voltage angle at a bus primarily affects the reactive power flow. (d) Change in voltage magnitude at a bus primarily affects the real power flow. In the light of the above statements, choose the most appropriate option from those given below : ✓ A 'a' and 'b' are correct B 'c' and 'd' are correct C 'a' is the only correct statement D 'd' is the only correct statement	0.5
63	A single phase transformer is rated110/440V, 2.5 kVA. The leakage reactance measured from the low voltage side is 0.06 Ω. Determine the leakage reactance in per unit. ✓ A 0.0124 per unit B 12.4 per unit C 4.84 per unit D 0.484 per unit	0.5
64	The maximum demand on a power station is 100MW. If the annual load factor of the station is 40%, determine the total energy generated in a year. A 8500 kWh B 8404 kWh	0.5

	✓ C $3504x10^5$ kWh D $3504x10^2$ kWh	
65	In case of a synchronous machine connected to bus, Synchronising coefficient should be _____ for the system to be stable. ✓ A Positive B Negative C Large Negative D Zero	0.5
66	Under a particular fault, the positive, negative and zero sequence component of a particular voltage is 0.7754 pu, -0.2246 pu and -0.2610 pu. Determine the voltage magnitude in phase A. A -0.2898 B -1.0187 C 1.0187 ✓ D 0.2898	0.5
67	The fuel cost function for three thermal plants in dollars per hour are given below $C_1 = 500+5.3\ P_1+0.004P_1^2$ $C_2 = 400+5.5P_2+0.006P_2^2$ $C_3 = 200 + 5.8P_3 + 0.009P_3^2$ Where P_1, P_2, P_3 are in MW. If the equal incremental cost is 8.5 dollar/MWh, the optimal economic values of P_1, P_2 and P_3 are _____, _____ and _____, respectively. A 350 MW, 200 MW, 150 MW B 400 MW, 200 MW, 150 MW ✓ C 400 MW, 250 MW, 150 MW D 150 MW, 200 MW, 350 MW	0.5
68	Identify the correct statement. ✓ A Transmission losses affect the economic dispatch of generators in large power system. B Transmission losses affect the economic dispatch of generators regardless of the size of power system. C Transmission losses affect economic dispatch of generators only in small power systems. D Transmission losses do not have any impact on the economic dispatch of generators.	0.5
69	A five Amps relay is set at 200%. If a current of 100 A flow through the relay, what will be its plug setting multiplier ? A 5 B 6 ✓ C 10 D 16	0.5

70	The State Space Model of LRC series circuit. A ✓ $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -1/LC & -R/L\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1/LC\end{bmatrix}u$ $y=\begin{bmatrix}1 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$ B $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ 1 & -R/L\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ \frac{1}{LC}\end{bmatrix}u$ $y=\begin{bmatrix}1 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$ C $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}1 & 1\\ 1/LC & 1/R\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ \frac{1}{LC}\end{bmatrix}u$ D $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}1 & 1/R\\ 1/L & 1/C\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1/R\end{bmatrix}u$ $y=\begin{bmatrix}0 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$	0.5
71	Find the transfer function of a given system $T(s)=\frac{Y(s)}{U(s)}$, where U(s) is the input and Y(s) is the output. $\dot{X}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -1 & -2 & -3\end{bmatrix}X+\begin{bmatrix}10\\ 0\\ 0\end{bmatrix}u$ $Y=\begin{bmatrix}1 & 0 & 0\end{bmatrix}X$ A $T(s)=\frac{10(s^2+5s+2)}{s^3+3s^2+2s+1}$ B $T(s)=\frac{10(s^2+5s+2)}{s^3+5s^2+2s+1}$ C ✓ $T(s)=\frac{10(s^2+3s+2)}{s^3+3s^2+2s+1}$ D $T(s)=\frac{10(s^2+3s+2)}{s^3+6s^2+4s+1}$	0.5
72		0.5

	The system is excited by unit impulse input. Hence. $m\ddot{x} + kx = \delta(t)$ Find the value of x(t) A $x(t) = \frac{1}{\sqrt{2m}} \sin \sqrt{\frac{k}{m}}\, t$ ✓ B $x(t) = \frac{1}{\sqrt{mk}} \sin \sqrt{\frac{k}{m}}\, t$ C $x(t) = \frac{1}{\sqrt{2mk}} \cos \sqrt{\frac{k}{m}}\, t$ D $x(t) = \frac{1}{\sqrt{mk}} \cos \sqrt{\frac{k}{m}}\, t$	
73	Consider the characteristic equation $s^4 + 2s^3 + (4 + k)s^2 + 9s + 25 = 0$ Using the Hurwitz criterion determine the range of k for stability ✓ A K > 109/18 B O ∠ k ∠ 1 C -0.5 ∠ k ∠ 2 D k ∠ 2	0.5
74	For the system shown in figure find the steady state error for a unit step input. Assume input and output units are same :  A 1 B 5 C -8 ✓ D -4	0.5
75		0.5

Given the system shown in figure write the output c(t), in general terms:



A $K_1+K_2e^{-2t}$

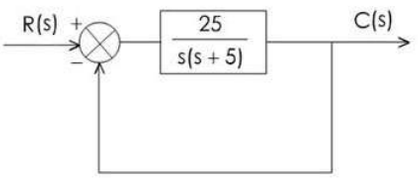
B $K_1+e^{2t}+e^{4t}+e^{5t}$

C $K_1+e^{-4t}+e^{-5t}$

D ✓ $K_1+K_2e^{-2t}+K_3e^{-4t}+K_4e^{-5t}$

76

For the system shown in figure, find the peak time and percent over shoot.



A ✓ 0.726 second, 16.303

B 0.5 second, 8.5

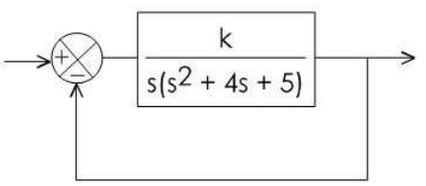
C 0.45 second, 10.48

D 0.84 second, 14.2

0.5

77

Consider the system shown in figure



Find the Break away or Break in points

A s = 1 s = 2.667

B ✓ s = -1 s = -1.667

C s = -1 s =1.667

D s = 1 s = - 1.667

0.5

78

Apply final value theorem to find the value of $\lim_{t\to\infty} f(t)$ when $F(s)=\frac{\omega}{s^2+\omega^2}$

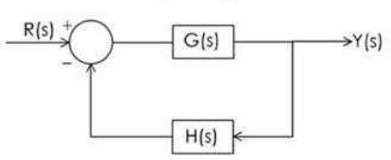
A 0

B 1

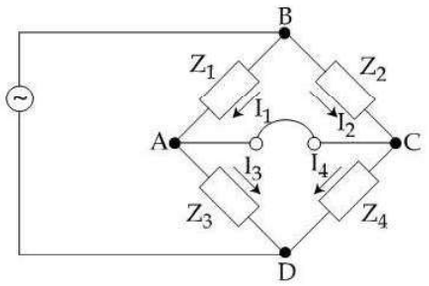
0.5

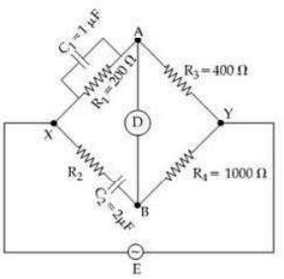
C ∞

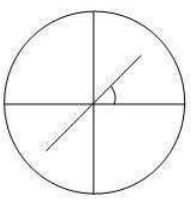
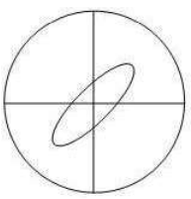
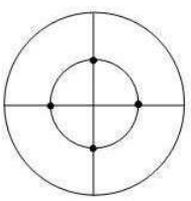
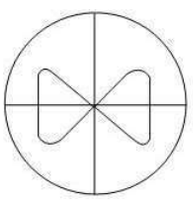
✓ D erroneous result

79	Consider that the discrete-data system is described by the difference equation y (k + 2) + 5y (k + 1) + 3y (k) = r (k + 1) + 2r (k) Find out the state matrices A and B. A $A=\begin{bmatrix}1 & 0\\ -5 & -3\end{bmatrix}, B=\begin{bmatrix}-3\\ 1\end{bmatrix}$ B $A=\begin{bmatrix}1 & 0\\ -5 & -3\end{bmatrix}, B=\begin{bmatrix}1\\ -3\end{bmatrix}$ C $A=\begin{bmatrix}0 & 1\\ -3 & -5\end{bmatrix}, B=\begin{bmatrix}-3\\ 1\end{bmatrix}$ ✓ D $A=\begin{bmatrix}0 & 1\\ -3 & -5\end{bmatrix}, B=\begin{bmatrix}1\\ -3\end{bmatrix}$	0.5
80	Consider the polynomial $\Delta s = s^6 + 4s^5 + 3s^4 + 2s^3 + s^2 + 4s + 4$. Find out if the system is stable. A Stable ✓ B Unstable C Partially/Marginally stable D Globally stable	0.5
81	A feedback control system is given as  The process transfer function is $G(s)=\frac{k(s+40)}{s(s+10)}$ and the sensor transfer function is $H(s)=\frac{1}{s+20}$ Find the gain k that results in marginal stability. Determine the oscillation frequency. A $k=800$, oscillation frequency $=\sqrt{800}$ rad/sec B $k=600$, oscillation frequency $=\sqrt{600}$ rad/sec	0.5

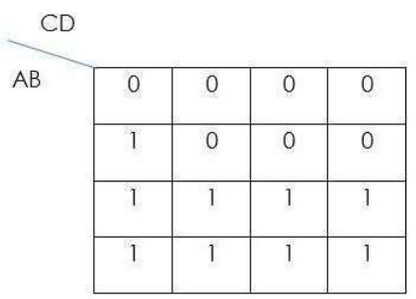
	C ✓ D $k=600$, oscillation frequency $=\sqrt{800}$ rad/sec	
82	The system may be represented in state space by the following equations: $\dot{x} = Ax + Bu$ $y = Cx + Du$ Find the transfer function expression of the system in terms of A, B, C and D A $G(s) = C(SI - A)^{-1} + D$ ✓ B $G(s) = C(SI - A)^{-1} B + D$ C $G(s) = C(SI + A)^{-1} D + B$ D $G(s) = D(SI + A)^{-1} B + C$	0.5
83	Consider the differential equation $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = 5U_s(t)$ Where $U_S(t)$ is the unit step function. The initial conditions are y(0)= -1 and $y^{(1)}(0)$= dy(t)/d t / t =0=2. Find out final value of y(t). A $\frac{3}{5}$ B $\frac{5}{3}$ ✓ C $\frac{5}{2}$ D $\frac{2}{5}$	0.5
84	Lead compensation _____ the gain cross over frequency and bandwidth; thus the speed of response of the closed loop system is _____. ✓ A increases, increased B decreases, increased C increases, decreased D decreases, decreased	0.5

85	The impedances of the basic ac bridge of fig. are given as follows :  $Z_1 = 100\,\Omega \angle 80°$ (inductive impedance) $Z_2 = 250\,\Omega$ (pure resistance) $Z_3 = 400\,\Omega \angle 30°$ (inductive impedance) Z_4 = unknown Determine the constants of the unknown arm. A $Z_4 = 750\,\Omega \angle 110°$ ✓ B $Z_4 = 1000\,\Omega \angle -50°$ C $Z_4 = 500\,\Omega \angle 50°$ D $Z_4 = 1000\,\Omega \angle 50°$	0.5
86	A 1 mA meter movement with an internal resistance of 100 Ω is to be converted into a (0 - 100) mA ammeter. Calculate the value of the shunt resistance required. A 0.1 Ω B 0.9 Ω ✓ C 1.01 Ω D 1.09	0.5
87	The deflecting torque of a moving iron instrument is : A $I^2 \frac{dL}{dQ}$ ✓ B $\frac{1}{2} I^2 \frac{dL}{dQ}$ C $I \frac{dL}{dQ}$	0.5

	D $\frac{1}{2} I \frac{dL}{dQ}$	
88	A simple slide wire is used for measurement of current in a circuit. The voltage drop across a standard resistor of 0.1 Ω is balanced at 100 cm. Find the magnitude of the current, if the standard cell emf of 1.45V is balanced at 145 cm. A 0.1A B 1A ✓ C 10A D 5.75A	0.5
89	For the bridge shown in fig., determine the value of R_2 and the frequency at which the bridge will balance.  A 200 Ω, 400 Hz ✓ B 400 Ω, 398 Hz C 398 Ω, 200 Hz D 400 Ω, 200 Hz	0.5
90	The value of the resistor is specified as 500 Ω ± 10% by a manufacturer. Find the limits of resistance between which the value is guaranteed. A 490 Ω to 510 Ω B 440 Ω to 490 Ω C 550 Ω to 600 Ω ✓ D 450 Ω to 550 Ω	0.5
91	A digital voltmeter uses an A/D converter which needs a start pulse, uses an analog comparator and has relatively fixed conversion time independent of the applied voltage. The A/D converter is : ✓ A Successive approximation converter. B Digital Ramp converter. C Dual slope converter D Counter type converter.	0.5

92	A 4 1/2 digit DVM is used for voltage measurements. Find the resolution of the meter in case its range is 10V. A 0.0001 B 0.6973 ✓ C 0.001 D 0.9673	0.5
93	Identify the correct Lissajous patterns on a CRT, when two equal magnitude sinusoidal voltages of equal frequency and a phase shift of 90^o applied to horizontal and vertical plates. A  B  ✓ C  D 	0.5
94	For a single phase controlled rectifier with a free wheeling diode across load, _____. A the instantaneous output voltage is always positive ✓ B the instantaneous output voltage may be positive or zero C the instantaneous output voltage may be positive, negative or zero D the instantaneous output voltage may be zero or negative	0.5
95		0.5

The simplified Boolean expression for the K-map given below is :



A $\overline{A} + BC$

✓ B $A + B\overline{C}\,\overline{D}$

C $\overline{A} + \overline{B}CD$

D $A + BC\overline{D}$

96 The following represents the truth table of a half subtractor. Which of the following entries in the truth table is incorrect ? 0.5

Sl. No	Bit A	Bit B	Difference D	Borrow C
1	0	0	0	0
2	0	1	1	1
3	1	0	0	1
4	1	1	0	0

A 1

B 2

C 4

✓ D 3

97 Which of the following represents the counting states of a 3 bit Ring counter ? 0.5

✓ A 1, 2, 4, 1, ...

B 1, 3, 7, 1, ...

C 0, 1, 2, 3, 4, 5, 6, 7, 0, ...

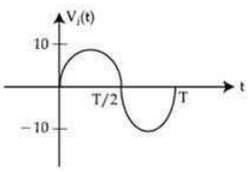
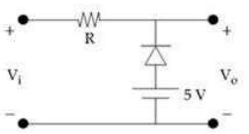
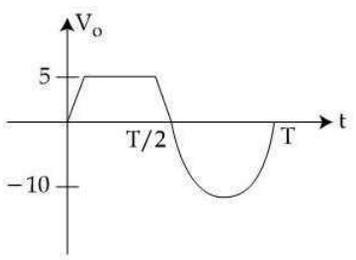
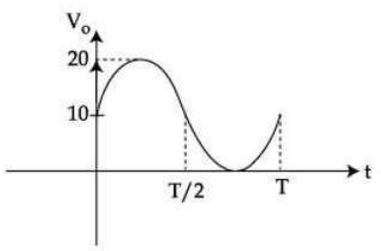
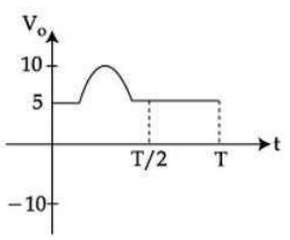
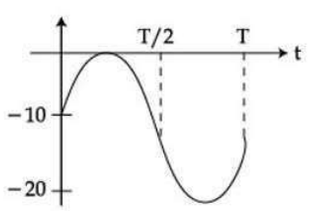
D 0, 2, 4, 6, 0,...

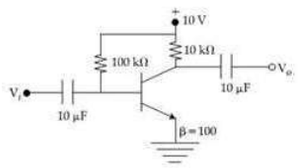
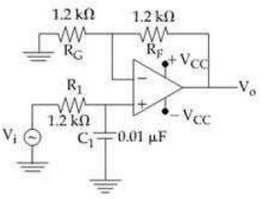
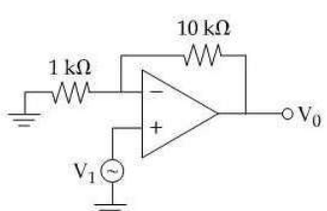
98 Which of the following describes the correct order of processes involved in Analog - to - Digital conversion ? 0.5

A Quantizing → Sampling → Encoding

✓ B Sampling → Quantizing → Encoding

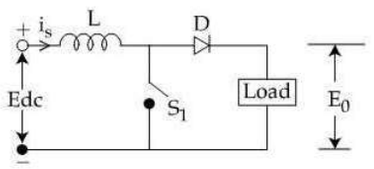
C Encoding → Quantizing → Sampling

	D Sampling → Encoding → Quantizing	
99	The differential and common mode gains of an op-amp are 8000 and 8 respectively. The value of Common Mode Rejection Ratio (CMRR) in dB is : A 57 dB ✓ B 60 dB C 63 dB D 1000 dB	0.5
100	The output signal Vo for the diode circuit shown below for the given input signal Vi is :   A  B  ✓ C  D  	0.5
101		0.5

	Consider the common emitter configuration shown in figure below. The value of emitter current is _____  ✓A 9.39 mA B 93 μA C 4.69 mA D 46 μA	
102	 The circuit shown above represents a : A low pass filter with cut off frequency 6.63 kHz B high pass filter with cut off frequency 6.63 kHz ✓C low pass filter with cut off frequency 13.26 kHz D high pass filter with cut off frequency 13.26 kHz	0.5
103	Consider the following statements : (i) The peak inverse voltage of a bridge rectifier is less than that of a full wave rectifier with center-tapped transformer (ii) In a bridge rectifier circuit, only about half as many turns are required for the secondary winding of the transformer compared to the center - tapped rectifier. Which of the following statements is true ? ✓A (i) and (ii) are correct B (i) and (ii) are incorrect C (i) is correct but (ii) is incorrect D (i) is incorrect but (ii) is correct	0.5
104	The following circuit represents  A Inverting amplifier of gain 10	0.5

	B Inverting amplifier of gain 11 C Non inverting amplifier of gain 10 ✓ D Non inverting amplifier of gain 11	
105	The Insulated Gate Bipolar Transistor (IGBT) is a hybrid power semiconductor device which combines the attributes of the _____ and the _____. A BJT, Thyristor B Diode, MOSFET C Thyristor, MOSFET ✓ D BJT, MOSFET	0.5
106	The output of a buck-boost converter is to be regulated at 10V. Converter is operating in continuous conduction mode with 15 V as input. Calculate the duty ratio. A 0.6 B 0.2 ✓ C 0.4 D 0.5	0.5
107	In boost converter, the average output current is less than the average inductor current by a factor of _____, where k is the duty cycle. A 1/k ✓ B 1 - k C k - 1 D k	0.5
108	In a three-phase diode bridge rectifier circuit, each diode conducts for _____. A 30^o B 60^o ✓ C 120^o D 90^o	0.5
109	In a practical single phase full converter, the number of SCRs conducting during commutation interval is _____. A 1 B 2 C 0 ✓ D 4	0.5

110	A single phase diode bridge rectifier supplies a highly inductive load. The load current can be assumed to be ripple free. The ac supply side current waveform will be : A Sinusoidal ✓ B Square C Constant DC D Triangular	0.5
111	Which of the following 3 phase AC to DC converter requires neutral point connection ? A 3 phase semi converter B 3 phase full converter ✓ C 3 phase half wave converter D 1 phase full converter	0.5
112	In DC-AC Inverters, the ratio of peak amplitude of modulating signal to peak amplitude of carrier signal is called as : A Carrier ratio ✓ B modulation index C Total harmonic distortion D Duty cycle	0.5
113	The equivalent circuit of an IGBT consists of : A Diode and MOSFET B Transistor and MOSFET ✓ C Thyristor and MOSFET D FET and GTO	0.5
114	The average output voltage in fully controlled bridge rectifier with RL load is : A $\frac{Em}{\pi}\cos\alpha$ B $\frac{Em}{2\pi}\cos\alpha$ ✓ C $\frac{2Em}{\pi}\cos\alpha$ D $\frac{2Em}{\pi}(1-\cos\alpha)$	0.5

115	The average load voltage in a Boost chopper is : A $E_O = Edc.\alpha$ ✓ B $E_O = \frac{Edc}{1-\alpha}$ C $E_O = Edc \cdot \frac{\alpha}{1-\alpha}$ D $E_O = \frac{Edc}{1+\alpha}$	0.5
116	A single phase half bridge Inverter has a resistive load of R = 3 Ω and dc input voltage E_{dc} = 24 V. Find average IGBT current ? A 0.5 A B 1.0 A C 1.5 A ✓ D 2.0 A	0.5
117	Identify the given circuit  ✓ A Step-up chopper B Step-down chopper C Step up-down chopper D Cuk converter	0.5
118	If Ton = $\frac{3}{4}$ T, the duty cycle α is: A 25% B 50% ✓ C 75% D 95%	0.5
119	The average value of output voltage of AC voltage controller is :	0.5

	A $\frac{Es}{\pi}(\cos\alpha - 1)$ B $\frac{\sqrt{2}\,Es}{\pi}(\cos\alpha - 1)$ C $\frac{Es}{2\pi}(\cos\alpha + 1)$ ✓ D $\frac{\sqrt{2}\,Es}{2\pi}(\cos\alpha - 1)$	
120	A six pulse converter operating at a frequency of 50 Hz produces _____ ripples in output dc voltage. A 50 Hz B 150 Hz ✓ C 300 Hz D 600 Hz	0.5