SoginerfinB Service Examination.

DO NOT OPEN THIS TEST BOOKLET UNTIL 'iQV ARE ASKED TO DO SO

T.B.C. : O-FTF-J-FFA **Test Booklet Series**

Serial N? 028441 '

TEST BOOKLET

ELECTRICAL ENGINEERING
Paper I

Time Allowed : Two Hours *Maximum Marks : 200*

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES *NOT* HAVE ANY UNPRINTED OR TORN OR. MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. ENCODE CLEARLY THE TEST BOOKLET SERIES A, B, C, OR D AS THE CASE MAY BE IN THE APPROPRIATE PLACE IN THE ANSWER SHEET.
3. You have to enter your Roll Number on the
   • Test Booklet in the Box provided alongside.
   DO NOT write *anything else* on the Test Booklet. L^_____
4. This Test Booklet contains 120 items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. Jn case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose *ONLY ONE* response for each item.
5. You have to mark all your responses *ONLY* on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. All items carry equal marks.
7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you witn your Admission Certificate.
8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator *only the Ansuier Sheet.* You are permitted to take away with you the Test Booklet.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. Penalty for wrong answers :
    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBJECTIVE TYPE QUESTION PAPERS.
    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, one-third (0*33) of the marks assigned to that question will be deducted *a»* pcnnlly.
    <ii> If a candidate gives more than one answer, it will be Ireated as n wrong answer even if one of the given answers happens to be correct and there will be same penalty as ubovc to that question (iii> If a question us left blank, i.c.. no answer is given by the candidate, there will b« no penalty for that question.

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1. What docs the cxprcwton - J . A represent ? |

(a) Power density

(b) Radiation resistance

(c) Magnetic energy density

(d) Electric energy density

2. Consider the following ntatvmonU : In an n-typc semiconductor

1. Fermi level lies below the donor level at room («mpcrature <T)
2. Fermi level lies above tho donor level as T -4 0.
3. Fcrihi level lie* in vulonc® band,

-I. Fermi level remains invariant with temperature.

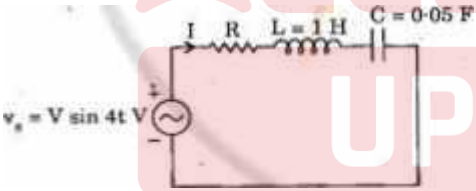
Which of the above stauments is/arc correct ?

<■) 1 only

<b) 1 and 2 only

(c) 2, 3 and 4

<d) 1, 2 and 3



For the circuit as whown nbovc, if the current leads the applied voltage by tan—[1] 2, what is the resistance value in «,hm ?

(n> 05

(b) 10

(c) 20

(d) 95

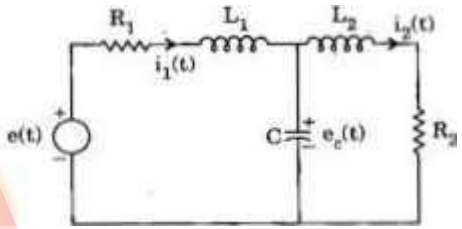
4. The dead tone in a pyrometer is 0 125 percent of the »pan The instrument is calibrnt^d fn>m 500' C tx> 2000. C. What tcmpcraturo change must occur before it can be detected in dcRrcc CcntiRrnde ?

(a) 187-5

<b) 1876

(c) 18 75

<d) 0 1876

5. 

Consider the following equations with rw»pect to the above network :

1. L(= Rji/t) - ec<t) ♦ e(t)

2. b, - -RjijU) - cc(t) ♦ o(t)

3

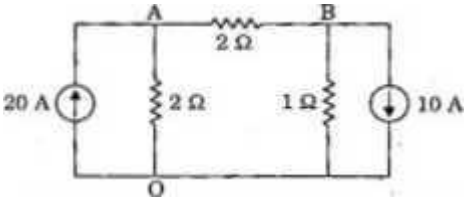
Which of the above statements iu/are correct ?

(u) 1only

(b) 2. 3 and 4

<c) 1. 3 nnd 4

(d) 1, 2and 4



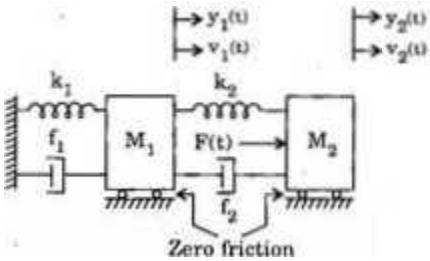
Kind tho voltage of the node A with rcspoct to 'O' for tho circuit as shown.

(a) 40 V ’

(b) 20 V

(c) 50 V

(d) 60 V



yjd) & $y_2(t)$ are displacemnnU

Vj(t) & $v_2(t)$ are velocities.

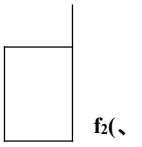
Which one of the following ia the correct free body diagram for the physical as shown in the figure above ?

7. Match Liat I with List II and select tho uniiwor correct using the code given below the lists :

	Lint / (Typ^ Of Instrument)	*List II (Example)*
A.	Indicating	L Wattmeter
B.	Abwlutc	• 2. Tangent galvanometer
C.	Recording	3. Aneroid barometer
D	Intflgrnting	4 Energy meter

Code :

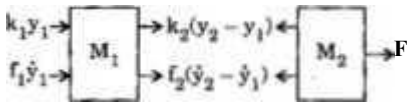
	A	B	c	D
(■)	1	2	3	4
<b)	4	2	3	1
(e)	1	3	2	4
(d)	4	3	2	1



(b) 

Mi*

(c> $f_i$yi<

(d) 

9. In a fluid flow gyatcm two fluids are mixed in appropriate proportion. The concentration nt tho mixing point is y(t) and it iR reproduced without change, T_d seconds later nl the monitoring point as b(t). Whnt ia the transfer function between b(t) and y<l) ? «Where S in diRtance between monitoring point and mixing point)

(u) $e^{-T<i}$

(b) e.V

(c) e-V

(d) c.、

10. Tho strain gauRO with a rcsintiincc of 250 ohm undergoes a change of 015 ohm. During a test tho »train is 1-5 x IO"[4]. What is the gauge factor ?

(a) 4 7

(b) 40 *M* 35

(d) 20

Eor the AC circuit nn shown above, if the rma voltage across the re«ixtor is 120 V, what is . the value of the inductor ?

(a) 0 5 H

(b) 0 6 H

(c) IO H

(d) 15 H

12. Which one of the following bridgoii will be uncd for the measurement of very low <b> Maxwell's bndge

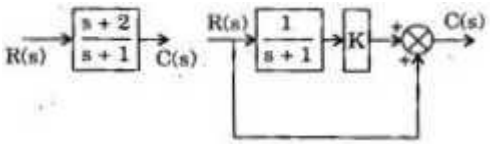
(c) Wheatstone bridge

(d) Hay's bridgo .

For what value of K. are the two block diagrams as shown above equivalent ? <■) 1

(b) 2

(c) (■ ♦ 1)

13. 

(d> (• ♦ 2)

Conaider the following :

1. Rise time
2. Settling time
3. Delay time
4. Peak time

14. Whnt in the correct »equcncc of the time domain specifications of a second order Kyntem in the ascending order of the values ?

(a) 2-4-1-3

<b) 3-4-1-2

(c) . 2 - 1 - 4 - 3 * (d> 3-1-4-2

Tho oscilloscope han an input 50 pF and *a* resistance of 2 MQ and voltage divider ratio (k) of'10. Whnt are pnriimeters of a high-impedance prolxt ?

(■) C, • 5 55 pF and R, «= 9 Mn

<b> C, ■ 5-55 pF and Rj - 18 Mn

<C) C, ■ 3 33 pF and R] - 9 Mft

15. <d) Cj =» i ll pF nnd $R_($ => 18 M«

16. A unity feedback system with open loop transfer function of - — is excited by a s(s + 5) of final

unit step input. How much tiipe will be required *for* the response to settle within *2%*

desired value ?

u> 0 25 nee

(b) 1 60 sec

(c) 2 40 sec

<d) 4 00 sec

17. Consider the following Btatementa :

1. • Amplifier gain and phase shift.
2. Filter transfer functions.
3. Two port network parameters.
4. Power gain in a two port circuit. Which of the above quantities can measured using a vector voltmeter ?

18.

Replace the above shown circuit by a single voltage source in series with an impedance.

(a) 2 V, 1 Q

(b) 1 v, 3 *if*

(c) 3 V. i *a*

(d) 2 V, 3 Q

A barium titanate crystal has a thickness of 2 mm. Its voltage sensitivity is

12 x 10^{-3} Vm/N. It is subjected to n pressure of 0 5 MN/m^2. What is the voltage generated ?

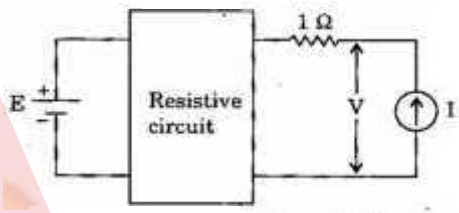
(a) 3 V

(b) 6 V

(c) 5 V

(d) 12 V

20.



be

For the circuit as shown above, if E = Ej and I is removed, then V = 5 volts. If E = 0 and I » 1 A, then V = 5 volts. For E = E, and I replaced by a.rcsictcr of 5 J2, what iB the value of V in volts ?

(a) 50

(b> 25

(c) 75

(d) 35

The impulse response of a second-order under-damped system started from rest is given by : ,

CXt) ■ 12 5 e"^{s,} sin 8t, t 2 0 What are the natural frequency and the damping factor of the system respectively ?

(a) 10 and 0-6 <b> 10 and 0 8

(c) 8 and 0-6 <d) 8 and 0-8

22. Whnt will be the type of the system, if the steady state performance of control system yioklK a non-zero finite value of the velocity error constant ?

typo-o

type-1

type-2

type-3

(a)

(b)

(c)

(d)

On which of the following factors docs hyaUresia loss *not* depend ?

(a) Mugnctic field intensity

24. (b) Frequency of the field

(c) Volume of the matenal

(d) Neal temperature

A «train gauge havinx a resmtancc of 500 ohm nnd n Rnuge factor 3-0 is bonded on a member of structure undergoing Unsilo nlrcss. If the chango in reaistancc of the gnugo in accurately monnured as 1-5 ohm, what in the value of slrtun «nffered by the member ?

(a) 001

25.

(b) OOOl

(c) 01

<■ (d) 0 003

>

(b)

(c)

26. Enr «he dreuit as shown above, what is the value ∝ 1'

4 A

3 A

2 A

1 A

27. Diiiftipntion factor, tan 5, of a capacitor is monnurcd by which bridge ?

(a) Anderson bridge

(b) Huy bridge

(c) Schering bridge

(d) Wien bridge

The characteristic equation of • feedback control nystem is Jtivcn by :

♦ $6s^2$ ♦ 9s ♦ 4 - 0 Whnt in the numl^r of rootn in the lcfl-half of the s-plane ?

(n) Three

28. (b) Two ' .

(c> One .

(d) Z«ro

Which one of the following in *not* a Maxwell's equation ?

(a) V x H = to + jci>e) E

(b) F - Q(E ♦ v x B)

(c) f H . ds = J J . d» ♦ j . da

C » •

(d) | B . d» > 0 •

Tho unit «tep response of a «yatem is (1 e"* (1 ♦ t)J u(t). What is the nnture of the aystem in turn of stability ?

(a) Unstable

(b) Stable

(c) Critically stable

(d) Oscillatory

29.

30. A D'Ar»onval galvanometer. 1 mA, 50 ohm is to be Converted to a 5 Amp-ammeter. What is the value of the shunt resistor, R_{fch} ?

(a) 10 ohm

(b) 1‘ohm
(c) 001 ohm
(d) 100 ohm

31. 100 Q

150 V

Consider the following, with respect to the circuit as shown above :

1. V_R = 100>/2 V
2. l'l_{rm}, = 2A
3. L = 0-25 H

Which of the above statements in/are correct ?

(n) 1 only

(b) 2 and 3

(c) - 1 nnd 3

(d) 1 and 2

32. Consider the following statements in connection with boundary relations of electric field :

1. In a Kinglc medium electric field is continuous.
2. The tangential components are the same on both sides of a boundary between two dielectrics.
3. The tangential electric field at the boundary of a dielectric and a current carrying conductnr with finite conductivity in zoro.
4. Normal component of the flux density is continuous across the chargc-froc boundary between two dielectrics.

Which of tho above ntatements ia/are correct ?

(a) 1 only

<h> 1, 2 and 3

(c) 1. 2 and 4 '

(d) 3 and 4 only

33. Consider the following ;

1. Phase margin
2. G:<in margin
3. Maximum overshoot
4. Bandwidth

Which of the above arc the frequency domain specifications required to design a control system ?

(a) 1 and 2 only

(b) 1 and 3 only

(c) 1, 3 and 4

(d) 1, 2 and 4

A 0 to 300 V voltmeter has an error of i 2% of fcd. What is the range of readings if true voltegc is 30 V ?

(a) 24 V - 36 V

(b) 20 V - 40 V

(c) 29 4 V - 30 6 V

(d) 20 V - 30 V '

35. A notwork function $Z(B) = \frac{V(s)}{v3}$ > has a single pole at s ----- ---and a single zero s ■ -75.

If the excitation v(t) = sin t, then what is tho angle of lead or Ing of the current ?

(a) Lead the voltage by 30"

(b) Lag the voltage by 30*

(c) Lead the voltage by 90'

(d) Lag the voltage by 90°

Magnetically hard materials do *not* poMOM |40. which of the fbllowinR characteristics ?

(a) High retentivity

(b> High coercivity

(c) Strong magnetic ruluctance

(d) Zero differential permeability

In a digital voltmeter, the oscillator frequency *is* 400 kHz. The ramp voltaco fnlla from 8 V U 0 V in 20 ms What ia the number of pulncR counted by the counter ?

<•> 8000

(b) 4000..

(c) 3200

(d) 1600

If the current llowinR through *a* 20 ohm rosiHtor is given o*,
»(I) = 4 + 5 sin <ot - 3 cos 3 u»t »• the power consumed by the <a) 1000 W

(b) 660 W

(c) 500 W

(d) 180 W

amp, then what resistor ?

What is the error in magnitude at the comer frequency for an asymptotic Bode majntitudr plot for the term (1 ♦ *txf*^{0} ?

(n) ± 20 n db

(b) t 6n db

(c) t 3 n db

(d) i 1 n db

Quartz and $BaTiO_3$ exhibit which of the following properties ?

(a) Magnetontriction

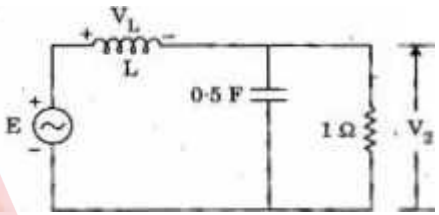
(b) FerromnKnotiHm

(c) Piezoelectricity

(d) Ferroelectricity

For the abovo given circuit, if aupply frequency, cn ■ 2 rad/*cc and V_2 = 2 Z 0. volts, then what is tho lend angle of V_L with V_2 ?

41.



a) 15*

(ь) 45*

(c) 90*

(d) 135*

A long utraight wire carries a current I - 1 A. At what distance is the magnetic field 1 Am'^{1} ? *

(a) 1-59 m

(b) 0159 m

(c) 0.0159 m

(d) 0 00159 *m*

A human nerve cell has an open circuit voltagv of 80 mV and it can deliver a current of 5 nA through a 6 M ohm load What is the maximum power available from the call ?

43. (a) 0 16 nW

<b) 16 mW

(c) 16 W

(d) 16 pW

44. What in the slope of the line due to factor in maitnitude part of Bode plot ?

<•>

(b)

(c)

Consider the fol!owing :

45. The poles ond zeroes of a driving point impodnno* function. z(s) are as

Polos 0. -2

Zeroes -1, -3

(d> —2 db per octave

then what in z(s) ?

(a) $\frac{(\bullet' \blacklozenge 2s)}{(2\ll^4 \blacklozenge 8s^*6)}$

(b) $\frac{(2\ll^a + 4.)}{(\bullet^4 {}^*4s + 3)}$

(c) $\frac{(\bullet^a {}^*4\gg{}^*3)}{(a^1 \blacklozenge 2B>}$

(d) $\frac{(48^s \blacklozenge 16s + 12)}{(\bullet'\blacklozenge 28)}$

1. Human errors

2. Improper application of inatrumcnU*

46. 3. Error due to worn parts of an iniitrumont

4. Errors due to effects of onvironmpnt Which of the above come under the type of system atic errors ?

(a) 1 and 2

(b) 2 and 3

(c) 3 and 4

(d) 1 and 4

47. Which one of the following stntcmcnts is correct for the open-loop transfer function ?

G(s)- $\frac{K(s * 3)}{\bullet<8\text{-}D}$ for K > 1

(■> Open-loop system is sUble but the closed-loop system is unstable.

(b) Open-loop system is unstablo but tho closed-loop system is stable.

(c) Both open-loop and closed-loop syRtemB arc unstable.

(d) Both open-loop and closed*I(K>p HystcmR arc stable.

4H. Consider tho (Allowing driving point intinitUnco functions :

$$K_M(S^{2*} 6)$$

• 1.

2. $\dfrac{<\!\!«**3S^{3}{}_{+}5®)}{(3_B4_{+6S}2)}$ X

3. $4_{S)}$, $(\bullet^{a} + 2)(«^{2}+e)$

4. $\dfrac{K<«^{2}.4><_S\text{^}9>}{H(s' +6)}$

Which of these aro LC immittance functions ?

(a) 1 and2

(b) 3 and4

(c) 2 and3

(d) 4 only

4». For which on«,of the following materials, in the Hall coefGcicnt zero ?

(a) Insulator

(b) Intrinnic ««miconductor

(c) Metal

(d> Non-mutal

50. Which one of the following dcwcribc* correctly the effect of adding a zero to the system ?

(a) System becomes osallalory

(b) Root IOCUH hhifls toward imaginary axin

(c> Relative fttability of the system

increaMM

(d) Operating range of K (or stable operation decreases

51. What is the generalized Maxwell's equation V x H ■ Jo -»• for free apace ? *at*

(a) V X n - 0

(b) V x fi = Je <c> VxH

(b) vx R - D

52. Which oiu< of the following is a frequency sensitive bridge ?

<a) Dc.Siiuty bridge (b> Schering bridge

(c) Wicn'it bridge

(d) Maxwoll's bridge

53. Root locux of s (s + 2) ■» K (s ♦ 4) = 0 i* a circle. What are the co-ordinate» of the centre of this arclc ?

<»> -2, 0

<b) -3, 0

(c) -4. 0

(d) -5,0

54. In a throe-phase, balanced, delta connected systom, each phase • voltage contiiinn *n* fundamental, a third hnmionic and a filth harmonic of RMS value* : 100 V, 30 V und 20 V respectively. What is the RMS value of the line-to-line voltage ?

(a) $J100^2+30^2*20^2$

(b) x $V1OO^2{}_{+}3O^2*2O^2$

(c) $\text{^}10_{\alpha'}\blacklozenge 20^2$

(d) 75 x $71OO^2$ + 20'

55. Mngnetic field intensity is $H = 3a_x \blacklozenge 7ya_y + 2xa_?$ A/m. What is the current density J A/m^2 ?

(a) $- 2a_y$

(b) $- 7a_z$

(c) $3a_x$

(d) $12a_Y$

56. Consider the following statements :

1. Bandwidth is increased.
2. Peak overshoot in tho step response is increased.

Which of thene are the effects of using lead compensation in a feudhack system ?

(a) 1 only

(b) 2 only

(c) Both 1 and 2 <d> Neither *I* nor 2

57. If the bandwidth of an oscilloscope is Rived as direct current to 10 MHz, whal is the fastest rise time a sine wave can have to be produced accurately by the oscilloscupe ? <□) 35 nsec

(b) 10 nsec

(c) 3-5 nsec

(d) 0-035 nsec

58. How much current must flow in a loop ,radiu» 1 m to produce a magnetic field 1 mAm^{-1} ? •

(a) 10 mA

(b) 15 mA

(c) 2 0 mA

(d) 2-5 mA

59. What is represented by state transition matrix of a system ?

(a) Free response

<b) Impulse response

(c) Step response

(d) Forced rcspooBe

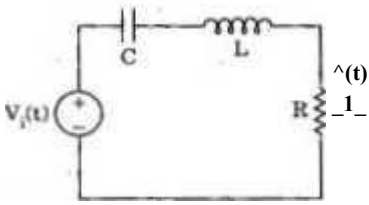
60. 

For the t-port network as shown above, what is the value of Y_{2l} parameter ?

(a) Y, * Y_3 <b> 6_m-Y2 .<o e_m-Y_3

<d> $^Y1 * ^Y2 + 8m$

61.



Eor the nbove shown network, the function

$G(s) = \frac{V_o(s)}{V_i(s)}$ 1« $\frac{4s}{s^2 + 4s + 20}$ when R is 2 ohm What is the value of L and C ?

(a) 03 II and 1 F

(b) 04 H and 05 F

(c) 05 H and 0 1 F

<d) as H and 001 F

62. Tho system matrix of a linear time invariant continuous lime system in given by r o ii

A = I I. What is the charactensUc -5j

equation ?

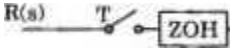
(a) ♦ 5s ♦ 3 = 0

(b> M^2 - 3. - 5 = 0

(c) K^2 ♦ 3R + 5 = 0 >

(d) ♦ 2 ■ 0

63.



C(.)

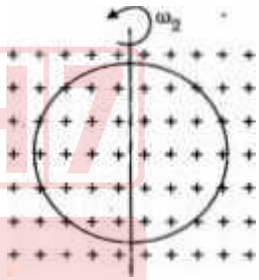
What is the transfer function of tho R(Z) sampled (into system ns shown above ?

<a) (Z - o"*)

(b) (Z-o"T)

(c) (l-2c-T) (e-T - Z)

(d) (l-2Ze-T) (Z-l)



A circular loop placed perpendicular to n uniform sinusoidal mngnetic Held of A-equency <ii| is revolved about an ax)H throuRh ita diameter at nn angular velocity '»2 rad/acc < u),) as ahown in the figure above. What are the frequencies for the e.m f. induced in the loop *7*

(a) «>j nnd <o2

(b) "I. * "2 and «ua

<c) "a- "ı - "2 and a>2

<d) "»-«"a "d "1 ♦"2

Consider tho following with respect to the above circuit :

1. The transfer function of the circuit id $\frac{10}{s710}$ •

2. If V]<1) = 20, $V_2(t)$ - 20 (1- o-^{0t}).

3. Jf Vjd) ■ 20 sin lOt, V_2<.)——.

$(s4-10)(s^2 + 100)$ Which of these ia/are correct ? .

<a) 1 only

(b) 1 and 2

(c) 1, 2 and 3

(d> 2 only

66. What is the initial slope of Bode magnitude plot of a typo-2 system ?

(a) - 20 db/decade

<b) + 20 dh<decade

(c) - 40 db/decade

<d) + 40 db/decade

<a) 30n 5_Z

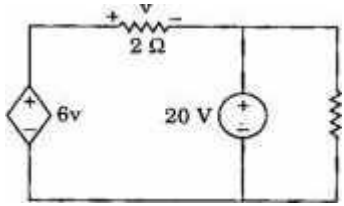
<b) 60n a_z

(c) 90n a_z

67. In free Rpacc

E(Z, t) = 120 κ cos (wt - PZ) a_x Vm^{-1}. What ia tho average power in Wm^2 ?

(d) 120rc a,



What is the current through the 2 0 resistance for the circuit as shown above ?

<a> 5 A

(b) 4A

<c) 3 A

(d) 2A

69. The open-loop tranafer function of a system has one pole in the right half of s-plonc. If the syHtem is to be closed loop stable, then (—1 + jO) point should have how many encirclements in the GH-plane ?

•(a> - 2

(b) - 1

(c) * 1

(d) + 2

70. Consider the following statements in connection with cylindrical waveguides :

1. At low frequency the propagation constant is real and wave doc* not propagate •
2. At intermediate frequency the propagation constant is zero and wave cuts off.
3. Al high frequency the cnnstnnt is imaginary propagates propagation and wave

At transition condition the cut-ofT frequency is inversely proportiomil t« the eigen values of the Bessel function for the respective TE_{nr} «node. Wliich of tho above statements is/an? corruct ?

<•) 1, 2 and 3
<b) 2 only .
<c) 2 and 3 only .
(d) 2, 3 *nd 4

71.

For tho circuit as shown above, what nrc tho values of the Norton's cquivulent current nnd conductance between AB terminals ?

(a)

(b) $\alpha \frac{v_1}{R_2}$ "d

<c > $\alpha \frac{v_1}{R_1}$ and G =

(d) -"^t 'nd G=_*

72. A 100 kV, 50 Hz supply is ted to n rectifier ammeter (using a bridge roctifier) through a capacitor. The PMMC ammoter of the rectifier instrument reads 45 x 10^{-3} Amp What i« the value of the capacitor ?

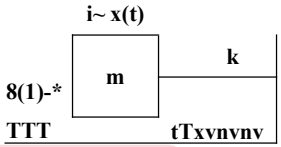
(a) 15 90 x $10^{-°}$ F

(b) 15 90 x 10^{-12} F

<c) 17 66 x I0"® F

<d) 17 66 x 10^{-1} F

73.



A mechanical system is as shown in the figure above. The system is set into moUon by applying a unit impulxe force 6(t). Assuming that the system is initially nt rest and ignoring friction, what in the displacement x(t) of mast* ?

(n) ★ exp (-m . t)

(b) sin <t)

(c) $\frac{1}{\sqrt{mk}} \sin\left(\sqrt{\frac{k}{m}} \cdot t\right)$

(d) $\frac{1}{\sqrt{mk}} \left(\sqrt{\frac{k}{m}} \cdot t\right)$

74.

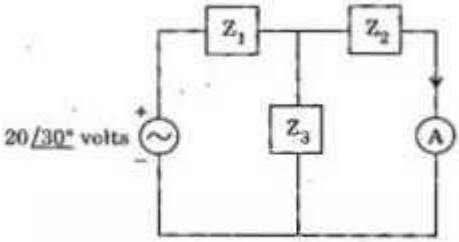
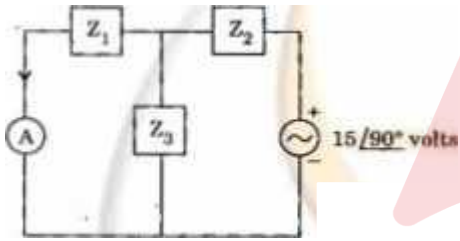


Fig. (a)



Fig(b)

For the circuit as shown in Fig. (a), tho current through the ammeter is
***4* Z -45* Ampn. What is the current in the ammeter**

for the circuit in Fig. (b) ? (•) 3 Z 15* Amp*

(b) 2Z3O* Amps

(c) 4 Z 45' Amps

(d> 5 Z-90* Amps

75. **The electric field of a uniform plane wave is given by :**

E - 10 ain (3n x 10^s t - *KZ)* *x ♦

10 cos (3x x !0" t - xZ) a_Y Vm-'. Whttt is

the corresponding mugnutic fidd H ? <a>

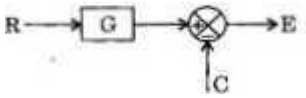
sin (3n x IO^8 I - nZ) ♦

cos (3n x 10^8 t - *rtZ)* (-«x) Am-' 377 A

(b) sin (3n x 10^8 t - *KZ)* <-*y) ♦

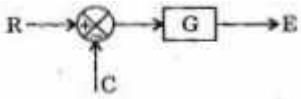
cos (3n x 10«t- <Z) <-5x) Am"[1]

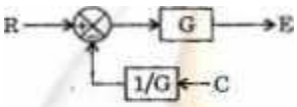
76.

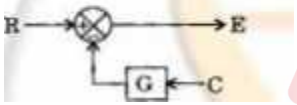


Which one of the following block dinKrams is equivalent to the above shown block diagram ?

(a)

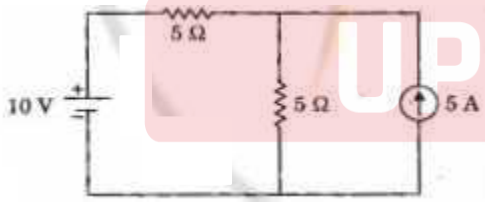






(d)

77.



What is the volUigo across the current source lor the above shown circuit ?

<a) 5 0 V

<b> 7-5 V

(c) 12 5 V

(d) 17 5 V

Consider the following statements : In a Hall effect experiment, the Hign of Hall volUge will change if

1. Direction of applied field is changed.
2. Direction of applied magnetic field is changed.
3. Direction of both applied eloctrie nnd magnetic field* nre changed.
4. Direction of current is changed. Which of the nbove statements i*/are correct ?

(■) 1. 2 and 3

(b) 3 only

(c) 1, 2 and 4 (d> 3 and 4

Consider the following slutcmenlH in connection with eloctromugnetic waves :

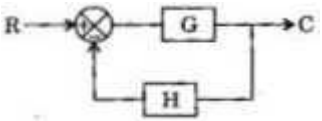
1. Conducting medium behaves like an open circuit U> the electromagnetic field.
2 At radio and microwave frequencies the relaxation timo is much less thnn the period.
3. In losS'Icstt dielectric the relaxation time is infinite.
4. Intrinsic impedance of a perfect dielectric medium is a pure resistance

Which of the ubove stMtemenU ie/nre correct ? (■> 1 only

(b) 1 and 2 only *M* 2 and 3 only

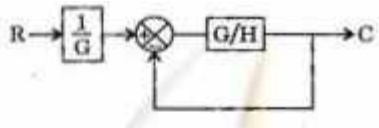
(d) 2, 3 and 4

80.

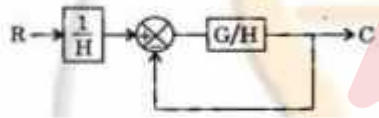


The above shown feedback control system ha«* to be reduced to equivalent unity feedback nyHtom. Which one of the following is equivalent ?

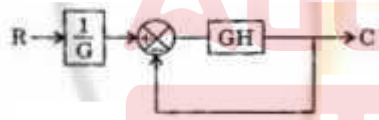
(a)



(b)

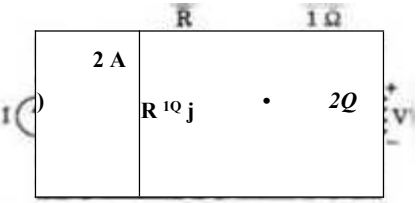


(c)



(d)

81.



What is the value of I for the nbovc nhown circuit, if V = 2 volts ?

(a) 2 A

(b) 4 A

(c) 6 A

(d) 8 A

82. In semiconductor strain gaugen, what happens when a tensile »train i» applied

(a) Resistance increases in N-type of matcnals

(b) Resistance materials incrcaHOR in P.type of

(c) Resistance incrcasofl in both P and N-type of materials

(d) Resistance decreases in both P and N-type of materials

83. For intrinsic GaAs, the room-tfmperature dectrical conductivity is 1(T® (ohm.mr^1, the electron and hole mobilities» are, respectively, 0 85 and 0 04 m^2/V-s. What in the intrinsic carrier concentration n^ nt tho room temperature ?

(a) $10^{2'}$ m^{-3}

(b> IO^{-20} m"^{3}

(c) 7 0 x 10^{*12} m^{-3}

(d) 7 0 x $IO^{"20}$ m^{t3}

H4. A second order system hnn a natural frequency of oacillations of 3 rad/soc and damping ratio of 0-5. What arc thu values of resonant fmquoncy and resonnnt peak of the sysicm ?

(a) 1.5 ra<VMX and 1-16

(b) 1 16 rnd/>oc and 1-5

(c) 116 rad/nec and 21

(d) 21 rnd/scc and 1.16

85. A transminnion line of chnrnctcristic impedance of 50 ohm is terminated by a load impedance of (15 - j20) ohm. What is the normalized load impedance ? H».

(a) 0« - j0 8

(b) 0 3 - j0 6

(c) 0 3 - j0 4

(d) 0 3 ♦ j0 4

86. The respomu* of an initially rclaxvd, linear constant-parameter network to a unit impulse applied at t - 0 ia $4®^{-21}$ u(t\ What is the response of this network to unit step function ? ,

<a) $2(l-o-^{2‘})$u(t)

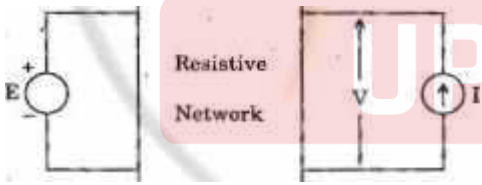
(b) 4 (o'* - •$-^{21}$) u(t)

(c) sin 2t

(d) (1 - $4e^{‘4t}$) u(t)

In the above shown circuit, if V • 3 volt» for E = 1 volt, 1 ■ 0; nnd V s 2 voltR (<>r I ■ 2 A and E = 0. Whon E = 1 volt and I in replaced by a resistor of 2

87.



ohm, then what iH the value ofV?

(a) 2 volts

(b) 4 volta

(c) 6 volt»

(d> 8 volts

For a curtain thermistor, the mnterial constant (0) is 3000 kelvin and its rcniHlancc •t 27* C is 10M) ohm. What ia the temperature coefficient of resistance▪ for this thermistor ?

88. (a) 0<W3 x IO"^{3} ohm/ohmTC (b> - 0 033 ohm/ohmCC

(c) - 3-33 ohm/ohm/'C

(d) - 3 0 ohm/ohnVC

Consider the following statuments :

1. A system is Mid to be stablv if iU output is bounded for any input.
2. A system *in* ntnblo if all the root* of the characteristic equation lie in tho left half of the s-plnne.
3. A system i» Htnble if ail the roots of the characteristic equation have negative real parts.
4. A second ordor system is always stable > for finite positive values of open loop gain.

Which of the ubvvo Ntntcments is/are corrwct ?

(▪> 2, 3 and 4

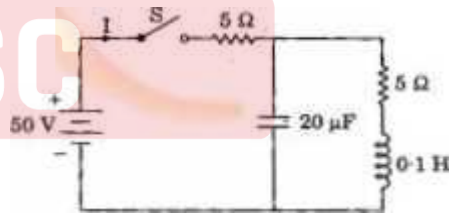
(b) 1 only

(c) 2 and 3 only

(d) 3 and 4 only

The network shown above is initially at rest. Whnt is the initinl current I when thu switch S is closed al t - 0 ?

(•) 0 A

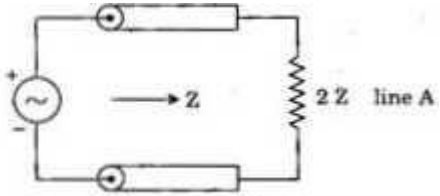


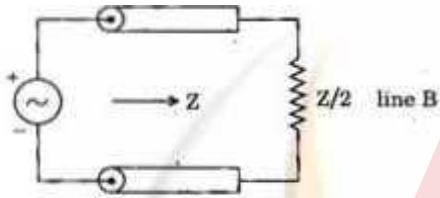
<b) 5 A

(c) 10 A

(d) 20 A

91.





Two loss-less resistive transmission lines each of characteristic impedance Z are conncCUx! as «hown in the circuits above. If the maximum voltage on the two lines ia the »ame and the power transmitted by line A is Wj, then what is the power transmitted by the lino B ?

(•> 4 W,

(b) 3 W,

(c) 2 W,

(d) 1 W,

•

The circuit as shown above is in the atondy Btato. The switch S is closed at t - 0. Whnt «re the values

92. Tbe open loop transfer function of a closed loop control system is given as : G(«) H(«) • —What ar« the number of asymptotes And the cantroid of the asymptotfs of the root-loci of dosed loop •yitem ?

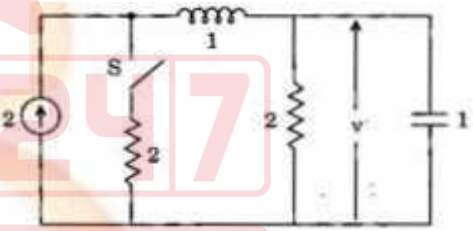
<•> -,; 0)

(b) -2, (2,0)

(,> 3 ;

(d) 2; (- 2, 0) .

93.



of v and at t ■ 0* ?

(a) 0 and 4

(b) 4 and 0

(c) 2 and 0

(d) 0 and 2

94. rhe transfer function of a phase-Icua-lead :ompenAntor is given by :

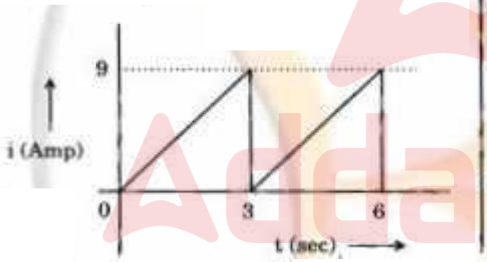
G "here T ≥ 0. What ia *the* maximum shift provided by such a compensator 7

(a) 90°

(b) 60°

(c) 45°

(d) 30°

95. 

The current waveform as shown above, is applied in a pure resistor of 10 Q. What ia in the resistor ? the power d

(a) 270 W

<b) 13& W

(c) 52 W

<d) 7 W

96. Consider the following RtutementB :

1. A phane lead network provides n positive phase angle over the frequency rnnge of interest.
2. Armature controlled d.c. servo motor is inherently a cloncd-loop system.
3. Phnse lag network provides KigniGcant amplification over the frequency rnnge of interest.
4. Transfer functions with zeroes in the right half of s-plnne is a non-minimum HysUm.

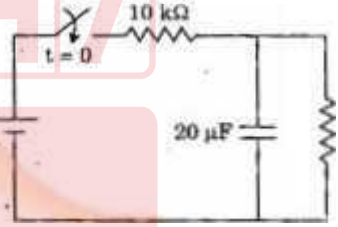
whioh of the above statementn i&/are ? correct

(a) 3 only

(b) 1 I nnd 2 only

(c) 1, 2 and 4

(d) 2, 3 and 4

97. 

lOkfi

The ■witch of abovo circuit was open long. nnd at t ? 0 it ia closed. What is final steady state voltage aertns capacitor and the time-constant of circuit ?

(al 0 V and 01 see

(b) 20 V and 0 2 MC

(O 10 V and

<d) 10 V and

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98. A linear system is described by the following state equations :

$$\dot{X}(t) = \begin{bmatrix} 0 & -2 \\ 1 & -3 \end{bmatrix} X + \begin{bmatrix} 2 \\ 0 \end{bmatrix} Y$$

Y(t) = (0 3!X

What is the transfer function of the system ?

The poles and zeroes of an all-pass network are located in which part of the s-plane ?

99. A transmission line section shows an input impcdnnce *of* 36 Q and 64 fi rvapectively, when short circuited and open circuited. What is the characteristic impedance of the transmission line ?

When a transfer function model is converted into state space model, the order of the system may be reduced during which one of the following

(a) 100 Q

(b> 50 *n*

(c) 45 *Q*

(d) 48 n

100. (a) Poles and zeroes are in the right half of s-plane

(b) Poles and zeroes are in the left half of s-planc

(c) Poles in the right half and zeroes in the left half of s-plane

(d> Poles in the left half and reroes in the right half of s-plane

101. conditions ?

(a) Some of the variables are not considered

(b) Some of the variables are hidden

(c) Pole, zero cancellation takes place

(d) The order of the nystem will never get changed .

102. How can the power supplied to a high frequency heating system be measured ?

(a) By dynamometer wattmeter

(b) By induction wattmeter

(c) By thermocouple type wattmeter

(d) By moving iron ammet«r and voltmeter

103. In an RLC Mrios resonant circuit, if the maximum a to red energy ix incruased by 10% and at the Hamc time the energy dissipated por cycle is reduced by 10%, it will result io which one of tho following ?

(a) An 11% decrease in quality factor

(b) An incrcnso in the renonant frequency by 11%

(c) A 22% increase in quality factor

(d) A decrease in the resonant frequency by 22%

104. If D is the rotcr diameter and L, the axial length, then a high performance a.c. servomotor it characteriied by which one of the following ?

(a) Large D nnd Large L

(b) Large D nnd Small L

(c) Small D and Small L

(d) Small D and Large L

105. Why is the network function,

(a) The highest degree of numerator and denominator polynomial* differ by one

(b) The t«rmA of the loweBt degree in the numerntor and denominator polynomials differ in degree by one

(c) The polca and zeroes have zero real Part*

(d) It has multiple poles on the imaginary axis

106. Consider the following statements with reference to hydraulic systems :

1. A small size actuator can develop *a* very large force or torque.

2. A source will) supply and return line required.

3. It is inaenRitivo to temperature changes.

Which of tho nbove statement» ia/ar«?

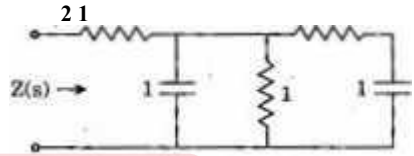
correct ?

(■) 1 only

(b) 2 only

(c) l.&nd 2

(d) 2 and 3



The network realization of RC impedance function,

Z(s)» u an uh own above What are the values of a and 0 ?

(a) 1 and 2

(b) 2 and 1

(c) 2 and 3

(d) 3 and 2

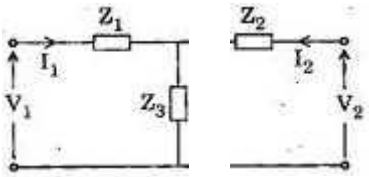
108. Which one of the following is *not* tho criterion un<'d to select potentiometer in n control system ?

(a) Accuracy

(b) Noise

(c) Time response

(d) Frequency rosponBe

109. 

If the Z-parameters for the T-network as shown above are Z_n = 40 Q, Z_{22} - 50 Q and Z_{l2} = = 30 Q, then what are the values of Z,, Z_2 and Z_3 ?

(a) 10 Q, 20 ft and 30 ft

(h) 20 Q, 30 ft and 20 ft

(c) 30 *il,* 40 ft and 10 ft

(d> 40 Q, 50 ft and 10 ft

Directions : *Each of the next eleven (11) items consists of two statements, one labelled as the 'Assertion (A)' and the other as 'Reason (R)'. You art to examine these tivo statements carefully and select the ansivers to these turns ufttng the codes given below:*

Codes :

<a) Both A and R arc individually true and R is the correct explanation of A

(h) Both A and R aro individually true but R is *not* the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true

110. *Assertion (A):* The semiconductor material used in making an optical source should be a direct bandgap material.

Reason (R) : Carrier recombination time is shorter in a direct bandgap semiconductor. .

111. *Assertion (A):* *A* capacitor has one pole at s = infinity and one tero at « ■ 0, where s = ju>, co is the angular frequency.

Reason (R): The driving point impedance of a capacitor is s

112. *Assertion (A):* To increase the range of an ammeter to measure high currents, it is required to connect a high resistor in shunt across the ammeter. The shunt resistor will divert the excess current and allow only

Reason (R): the rated current *to* paw through the deflecting system of the ammotcr. The sensitivity of a voltmeter is often expressed in terms of ohms-pcr-volt.

113. *Assertion (A):* High sensitivity voltmeters use a, basic d'Arsonvai meter

Reason (R): which has high sensitivity.

114. *Assertion (A):* bridge type of mcnsurcmcnt. it required that the indicator UMK! to show tho balance condition of the bridge should have very high nennitivity.

Hea/ton (R): Thu accuracy of tho null-indicator doc* not play any role in n. bridge monRurement

liS. *Assertion (A):* An electronic millivoltmeter used to read very low a.c voltages nt high frequcncimi is an amplificr-rectiGcr type of motor.

Reason (R): Tho diodes cannot rectify low a.c. voltages of millivolt order.

1 IB. *Assertion (A):* Electron beam »witch is uwod in a multitrnco CRO.

Reason (R) : Electron benm «witch input signal and gives a Kteady wavoform on tho CRO screen.

117. *Assertion (A) :* Random errors can be minimized by statistical methods.

Reason (li) Theso are cauiwd by arithmetic error .while taking readings.

118. *Assertion (A):* The stator windingn of a control transformer has higher impedance per phafo.

Reason (R): The rotor of a control transformer is cylindrical in »hnpe.

Assertion (A): Addition of a pole to the forwnrd path tiitnsfer function of unity feedback system increases the *rise* time of «lep response. Tho additional pole hnw the effect of incrcaoinR the bandwidth of the syntcm

Reason (R); *

120. *Assertion (A):* Knowing magnetic vector potential A at a point, the flux density B at that point enn be obtainod. V . A - 0

Reason (R):

SPACE FOR ROUGH WORK