Fully Solved

4000 MCQs

For

ESE, GATE, PSUs

Electronics Engineering

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PREFACE

B. Singh (Ex. IES)

This Electronics Engineering practice book containing nearly 4000 MCQs focuses in-depth understanding of subjects which has been segregated topicwise to disseminate all kind of exposure to students in terms of quick learning and deep apt. The topicwise segregation has been done to align with contemporary competitive examination pattern. Attempt has been made to bring out all kind of probable competitive questions for the aspirants preparing for ESE, GATE and PSUs. The content of this book ensures threshold level of learning and wide range of practice questions which is very much essential to boost the exam time confidence level and ultimately to succeed in all prestigious engineers' examinations. It has been ensured from MADE EASY team to have broad coverage of subjects at chapter level.

While preparing this book utmost care has been taken to cover all the chapters and variety of concepts which may be asked in the exams. The solutions and answers provided are upto the closest possible accuracy. The full efforts have been made by MADE EASY Team to provide error free solutions and explanations.

I have true desire to serve student community by way of providing good sources of study and quality guidance. I hope, this book will be proved an important tool to succeed in competitive examinations. Any suggestions from the readers for the improvement of this book are most welcome.

B. Singh (Ex. IES)
Chairman and Managing Director
MADE EASY Group

CONTENTS

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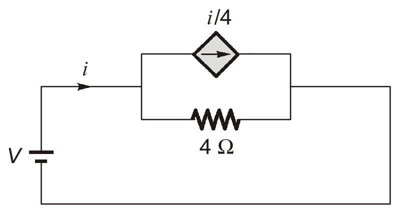
UNIT

1

Network Theory

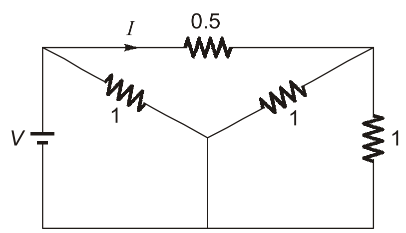
1. Basic of Network Analysis

Q.1 In the network shown below, the effective resistance faced by the voltage source is



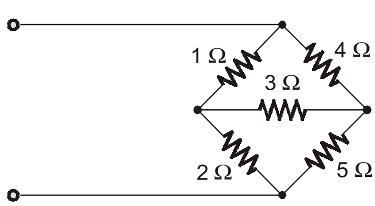
(a) 4 Ω (b) 3 Ω
(c) 2 Ω (d) 1 Ω

Q.2 In the circuit shown in the figure, if $I = 2$ A, then the value of the battery voltage V will be



(a) 5 V (b) 3 V
(c) 2 V (d) 1 V

Q.3 The input resistance of the circuit shown is

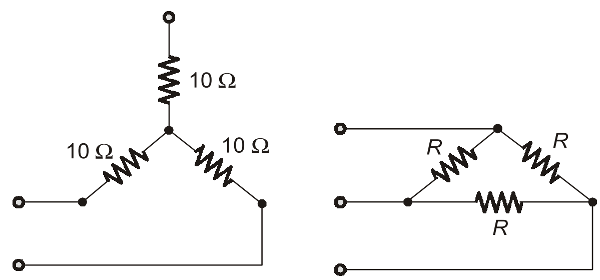


(a) 1 Ω (b) 3.36 Ω
(c) 2.24 Ω (d) 1.12 Ω

Q.4 In a network made up of linear resistors and ideal voltage sources, values of all resistors are doubled. Then the voltage across each resistor is

(a) Doubled
(b) Halved
(c) Decreased four times
(d) Not changed

Q.5 Star connected load is shown in the figure. The equivalent delta connection has a value of R in Ω is

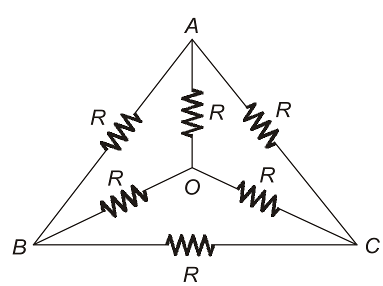


(a) 10 Ω (b) 30 Ω
(c) 10/3 Ω (d) 20/3 Ω

Q.6 Kirchhoff's current law is valid for

(a) DC circuit only
(b) AC circuit only
(c) Both DC and AC circuits
(d) Sinusoidal source only

Q.7 The effective resistance between the terminals A and B in the circuit shown in the figure is



(a) R (b) $R - 1$
(c) $R/2$ (d) $6R/11$

Q.8 The nodal method of circuit analysis is based on

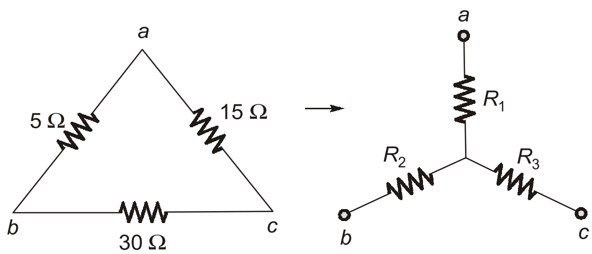
(a) KVL and Ohm's law
(b) KCL and Ohm's law
(c) KCL and KVL
(d) KCL and KVL and Ohm's law

Q.9 Twelve 1 Ω resistances are used as edge to form a cube. The resistance between two diagonally opposite corners of the cube is

(a) $\frac{5}{6}\Omega$ (b) $1\ \Omega$

(c) $\frac{6}{5}\Omega$ (d) $\frac{3}{2}\Omega$

Q.10 A delta connected network with its *Y*-equivalent is shown in figure. The resistances R_1, R_2 and R_3 (in ohms) are respectively



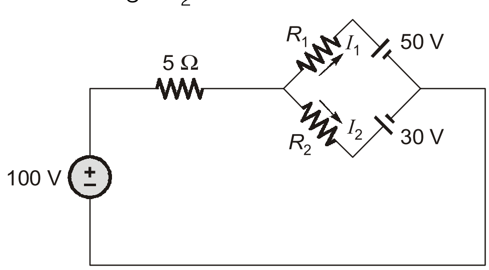
(a) 1.5 Ω, 3 Ω and 9 Ω
(b) 3 Ω, 9 Ω and 1.5 Ω
(c) 9 Ω, 3 Ω and 1.5 Ω
(d) 3 Ω, 1.5 Ω and 9 Ω

Q.11 If each branch of a delta circuit has impedance $\sqrt{3}\,Z$, then each branch of equivalent Y-circuit has impedance

(a) $\frac{Z}{\sqrt{3}}$ (b) Z

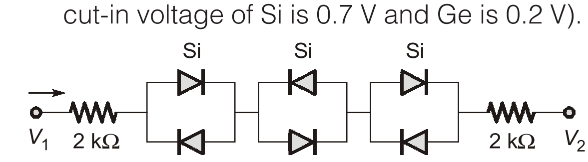
(c) $2\sqrt{3}\,Z$ (d) $\frac{Z}{3}$

Q.12 In the circuit shown, what are the values of R_1 and R_2 when the current flowing through R_1 is 1 A and through R_2 is 5 A?



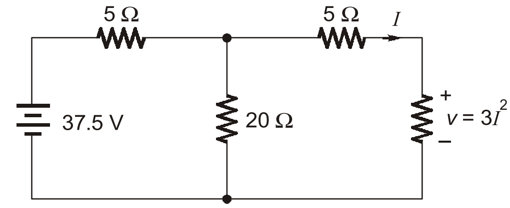
(a) 20 Ω, 8 Ω (b) 12 Ω, 5 Ω
(c) 8 Ω, 12 Ω (d) 8 Ω, 20 Ω

Q.13 Determine the current in the network (Assume cut-in voltage of Si is 0.7 V and Ge is 0.2 V).



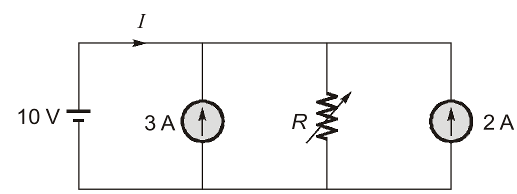
(a) 1.6 mA (b) 1.575 mA
(c) 1.557 mA (d) None of these

Q.14 The value of 'I' in the circuit given below is



(a) –5 A (b) 5 A
(c) –2 A (d) 2 A

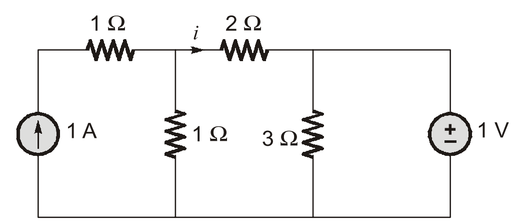
Q.15 Consider the electrical network shown below.



What is the value of *R* so that current I is zero?

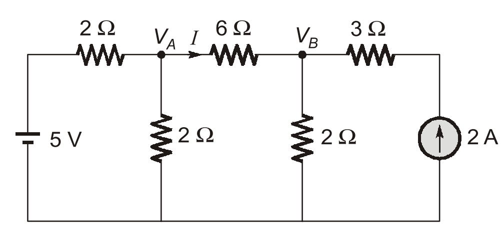
(a) 2 Ω (b) 5 Ω
(c) 4 Ω (d) 3 Ω

Q.16 The current i in the network given below is



(a) 1 A (b) 2 A
(c) 3 A (d) 0 A

Q.17 Node voltages V_A and V_B are as shown in the circuit below



V_A and V_B are respectively

(a) $\frac{11}{3}$ V and $\frac{8}{3}$ V (b) 6 V and 8 V

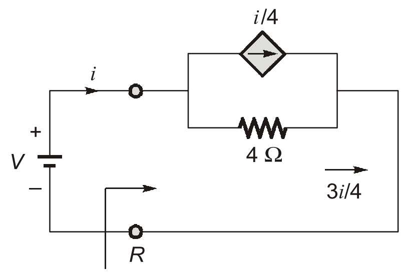
(c) $\frac{24}{9}$ V and $\frac{33}{9}$ V (d) None of these

Answers Network Theory

1.	(b)	2.	(c)	3.	(c)	4.	(d)	5.	(b)	6.	(c)	7.	(c)	8.	(b)
9.	(a)	10.	(a)	11.	(a)	12.	(a)	13.	(b)	14.	(d)	15.	(a)	16.	(d)
17.	(c)	18.	(c)	19.	(c)	20.	(b)	21.	(d)	22.	(c)	23.	(a)	24.	(d)
25.	(a)	26.	(a)	27.	(c)	28.	(d)	29.	(d)	30.	(d)	31.	(d)	32.	(d)
33.	(d)	34.	(a)	35.	(a)	36.	(b)	37.	(c)	38.	(c)	39.	(c)	40.	(b)
41.	(d)	42.	(c)	43.	(a)	44.	(d)	45.	(d)	46.	(a)	47.	(d)	48.	(d)
49.	(b)	50.	(a)	51.	(c)	52.	(a)	53.	(d)	54.	(d)	55.	(a)	56.	(d)
57.	(c)	58.	(d)	59.	(c)	60.	(c)	61.	(d)	62.	(c)	63.	(d)	64.	(b)
65.	(c)	66.	(b)	67.	(c)	68.	(b)	69.	(c)	70.	(c)	71.	(a)	72.	(c)
73.	(c)	74.	(c)	75.	(b)	76.	(d)	77.	(d)	78.	(d)	79.	(a)	80.	(b)
81.	(c)	82.	(d)	83.	(b)	84.	(c)	85.	(d)	86.	(a)	87.	(c)	88.	(d)
89.	(d)	90.	(a)	91.	(b)	92.	(b)	93.	(d)	94.	(c)	95.	(b)	96.	(b)
97.	(d)	98.	(c)	99.	(c)	100.	(d)	101.	(b)	102.	(c)	103.	(d)	104.	(d)
105.	(a)	106.	(c)	107.	(b)	108.	(b)	109.	(c)	110.	(c)	111.	(a)	112.	(c)
113.	(c)	114.	(b)	115.	(a)	116.	(b)	117.	(a)	118.	(b)	119.	(c)	120.	(a)
121.	(c)	122.	(d)	123.	(c)	124.	(b)	125.	(a)	126.	(a)	127.	(d)	128.	(d)
129.	(d)	130.	(b)	131.	(b)	132.	(b)	133.	(c)	134.	(d)	135.	(d)	136.	(c)
137.	(c)	138.	(b)	139.	(c)	140.	(d)	141.	(d)	142.	(c)	143.	(d)	144.	(c)
145.	(b)	146.	(a)	147.	(d)	148.	(a)	149.	(c)	150.	(b)	151.	(c)	152.	(c)
153.	(b)	154.	(c)	155.	(a)	156.	(b)	157.	(c)	158.	(a)	159.	(b)	160.	(d)
161.	(a)	162.	(c)	163.	(b)	164.	(a)	165.	(c)	166.	(c)	167.	(b)	168.	(d)
169.	(c)	170.	(c)	171.	(a)	172.	(c)	173.	(c)	174.	(c)	175.	(d)	176.	(b)
177.	(b)	178.	(c)	179.	(b)	180.	(d)	181.	(a)	182.	(c)	183.	(d)	184.	(c)
185.	(d)	186.	(b)	187.	(c)	188.	(a)	189.	(c)	190.	(b)	191.	(a)	192.	(c)
193.	(c)	194.	(c)	195.	(b)	196.	(d)	197.	(b)	198.	(c)	199.	(a)	200.	(c)
201.	(b)	202.	(c)	203.	(c)	204.	(c)	205.	(c)	206.	(a)	207.	(b)	208.	(d)
209.	(a)	210.	(b)	211.	(a)	212.	(a)	213.	(a)	214.	(b)	215.	(b)	216.	(d)
217.	(d)	218.	(b)	219.	(c)	220.	(d)	221.	(a)	222.	(d)	223.	(c)	224.	(d)
225.	(b)	226.	(a)	227.	(d)	228.	(b)	229.	(a)	230.	(d)	231.	(d)	232.	(a)
233.	(a)	234.	(d)	235.	(d)	236.	(b)	237.	(b)	238.	(d)	239.	(a)	240.	(d)
241.	(d)	242.	(b)	243.	(a)	244.	(c)	245.	(b)	246.	(c)	247.	(c)	248.	(a)
249.	(a)	250.	(c)	251.	(d)	252.	(c)	253.	(b)	254.	(b)	255.	(b)	256.	(c)
257.	(c)	258.	(a)	259.	(c)	260.	(b)	261.	(c)	262.	(d)	263.	(d)	264.	(a)
265.	(b)	266.	(a)	267.	(a)	268.	(c)	269.	(c)	270.	(c)	271.	(d)	272.	(c)
273.	(b)	274.	(b)	275.	(b)	276.	(c)	277.	(b)	278.	(c)	279.	(b)	280.	(d)
281.	(d)	282.	(a)	283.	(d)	284.	(c)	285.	(d)	286.	(c)	287.	(b)	288.	(b)
289.	(a)	290.	(c)	291.	(c)	292.	(b)	293.	(b)	294.	(a)	295.	(a)	296.	(d)
297.	(c)														

Explanations

1. (b)



$$R = \frac{V}{i}$$

Using source transformation and KVL, we get,

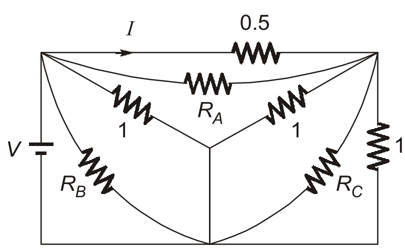
$$V + i = 4i$$

or, $$V = 3i$$

$$\Rightarrow \quad R = \frac{V}{i} = 3\ \Omega$$

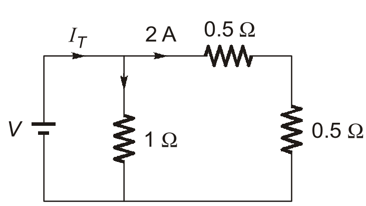
2. (c)

Given circuit:



Y-Δ transforming

$$R_A = \infty$$
$$R_B = 1\ \Omega$$
$$R_C = 1\ \Omega$$

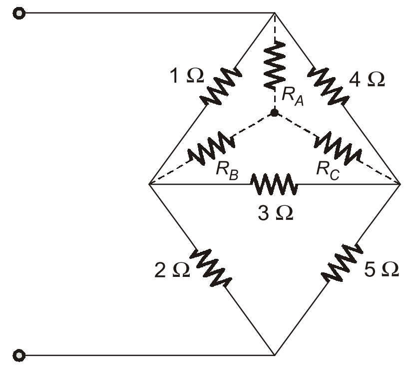


By current division rule

$$I_T = 2 \times 2 = 4\ \text{A}.$$

$$\because \quad V = I_T \times R = 4 \times 0.5 = 2\ \text{V}$$

3. (c)



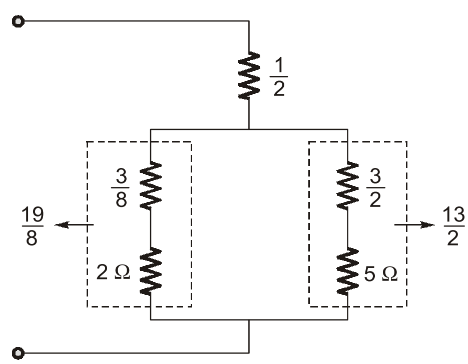
Δ-*Y* conversion:

$$R_A = \frac{4}{8} = \frac{1}{2}$$

$$R_B = \frac{3}{8}\ \Omega$$

$$R_C = \frac{12}{8}\ \Omega = \frac{3}{2}$$

Redrawing the circuit,



$$R_{in} = \frac{1}{2} + \left(\frac{19}{8} \parallel \frac{13}{2}\right)$$

$$R_{in} = 2.24\ \Omega$$

4. (d)

Ideal voltage source keeps the terminal voltage constant so accordingly current will change and the voltage across each resistor is unchanged following superposition principle.

5. (b)

$$R = \frac{1}{10}[(10 \times 10) + (10 \times 10) + (10 \times 10)] = 30$$

UNIT 2

Control Systems

1. Block Diagram and Signal Flow Graph

Q.1 The impulse response of an initially relaxed linear system is $e^{-2t}\,u(t)$. To produce a response of $te^{-2t}\,u(t)$, the input must be equal to

(a) $2e^{-t}\,u(t)$ (b) $\frac{1}{2}e^{-2t}\,u(t)$
(c) $e^{-2t}\,u(t)$ (d) $e^{-t}\,u(t)$

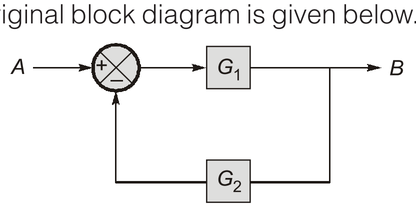
Q.2 As compared to closed loop system, an open loop is
(a) more stable as well as more accurate
(b) less stable as well as less accurate
(c) more stable but less accurate
(d) less stable but more accurate

Q.3 Signal flow graph is used to find
(a) Stability of the system
(b) Controllability of the system
(c) Transfer function of the system
(d) Poles of the system

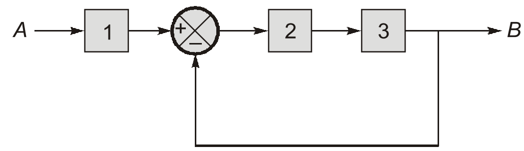
Q.4 The transfer function of the system is $\dfrac{2s^2+6s+5}{(s+1)^2\,(s+2)}$, the characteristic equation of the system is
(a) $2s^2 + 6s + 5 = 0$
(b) $(s + 1)^2\,(s + 2) = 0$
(c) $2s^2 + 6s + 5 + (s+1)^2\,(s + 2) = 0$
(d) $2s^2 + 6s + 5\,(s + 1)^2\,(s + 2) = 0$

Q.5 With negative feedback in a closed loop control system, the system sensitivity to parameter variations
(a) increases (b) decreases
(c) becomes zero (d) becomes finite

Q.6 Original block diagram is given below.



Equivalent block diagram is given below.

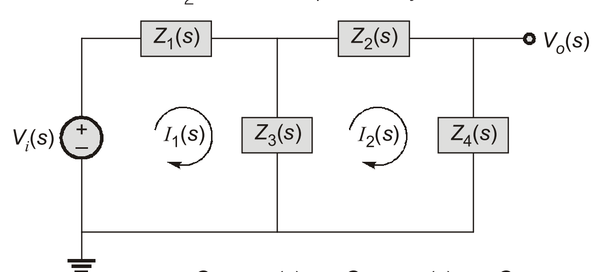


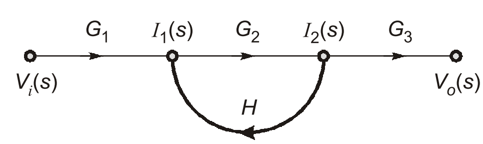
blocks 1, 2 and 3 are respectively

(a) G_1, G_2, G_1 (b) $\frac{1}{G_1}, \frac{1}{G_2}, \frac{1}{G_1}$

(c) $\frac{1}{G_2}, G_2, G_1$ (d) $\frac{1}{G_1}, G_1, G_2$

Q.7 An electrical system and its signal flow graph representation are shown in figure below. The value of G_2 and H respectively are





(a) $\dfrac{Z_3(s)}{Z_2(s)+Z_3(s)+Z_4(s)}, \dfrac{-Z_3(s)}{Z_1(s)+Z_3(s)}$

(b) $\dfrac{-Z_3(s)}{Z_2(s)-Z_3(s)+Z_4(s)}, \dfrac{-Z_3(s)}{Z_1(s)+Z_3(s)}$

(c) $\dfrac{-Z_3(s)}{Z_2(s)-Z_3(s)+Z_4(s)}, \dfrac{Z_3(s)}{Z_1(s)+Z_3(s)}$

(d) $\dfrac{Z_3(s)}{Z_2(s)+Z_3(s)+Z_4(s)}, \dfrac{Z_3(s)}{Z_1(s)+Z_3(s)}$

Q.8 The open loop DC gain of a unity negative feedback system with closed loop transfer function $\dfrac{s+4}{s^2+7s+13}$ is

(a) $\frac{4}{13}$ (b) $\frac{4}{9}$

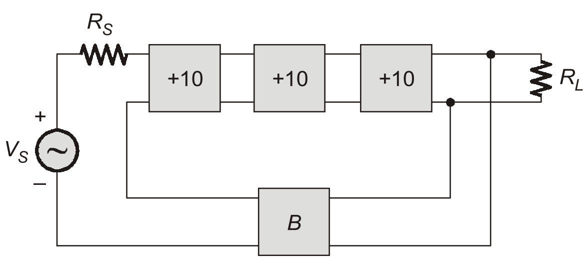
(c) 4 (d) 13

Q.9 Which one of the following is the transfer function of a linear system whose output is t^2e^{-t} for a unit step input?

(a) $\frac{s}{(s+1)^3}$ (b) $\frac{2s}{(s+1)^3}$

(c) $\frac{1}{s^2(s+1)}$ (d) $\frac{2}{s(s+1)^2}$

Q.10 Consider the following amplifier with negative feedback



If the closed loop gain of the above amplifier is +100, the value of B will be

(a) -9×10^{-3} (b) $+9 \times 10^{-3}$

(c) -11×10^{-3} (d) $+11 \times 10^{-3}$

Q.11 Laplace transform, $F(s)$ of a function, $f(t)$ is given by

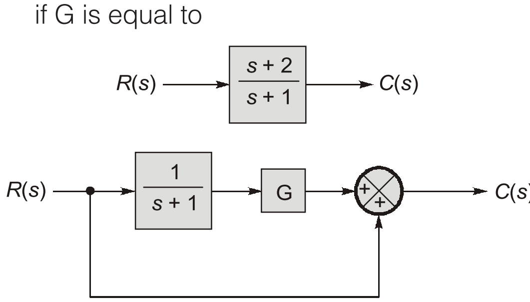
$$F(s) = \frac{10s(s+7)}{(s+1)(s+8)(s+10)}$$

The initial and final values of $f(t)$ will be respectively

(a) zero and 1 (b) zero and 10

(c) 10 and zero (d) 70 and 80

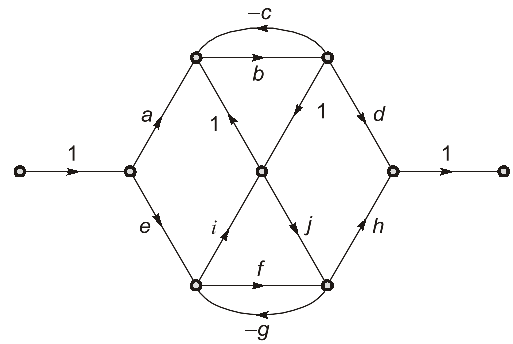
Q.12 The block diagrams shown in figure, are equivalent if G is equal to



(a) $s + 1$ (b) 2

(c) $s + 2$ (d) 1

Q.13 For the SFG shown in figure the graph determinant Δ is



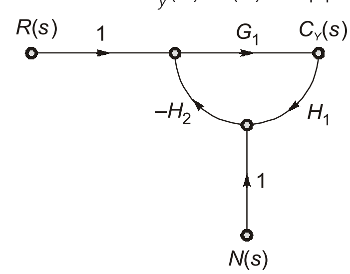
(a) $1 - bc - fg - bcfg - cigi$

(b) $1 - bc - fg - cigi + bcfg$

(c) $1 + bc + fg + cigj + bcfg$

(d) $1 + bc + fg + bcfg + jgj$

Q.14 A closed-loop system is shown in figure. The noise transfer function $C_y(s)/N(s)$ is approximately



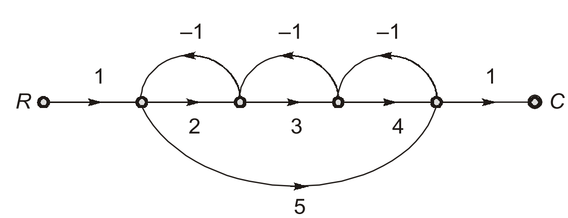
(a) $\frac{1}{G_1(s)\,H_1(s)}$ For $|G_1(s)\,H_1(s)\,H_2(s)| << 1$

(b) $\frac{1}{-H_1(s)}$ For $|G_1(s)\,H_1(s)\,H_2(s)| >> 1$

(c) $\frac{1}{H_1(s)\,H_2(s)}$ For $|G_1(s)\,H_1(s)\,H_2(s)| >> 1$

(d) $\frac{1}{G_1(s)\,H_1(s)\,H_2(s)}$ For $|G_1(s)\,H_1(s)\,H_2(s)| << 1$

Q.15 In the signal flow graph shown in figure the gain C/R is



(a) $\frac{44}{23}$ (b) $\frac{29}{19}$

(c) $\frac{44}{19}$ (d) $\frac{29}{11}$

Answers Control Systems

1.	(c)	2.	(c)	3.	(c)	4.	(b)	5.	(b)	6.	(c)	7.	(d)	8.	(b)
9.	(b)	10.	(a)	11.	(c)	12.	(d)	13.	(d)	14.	(b)	15.	(a)	16.	(c)
17.	(a)	18.	(d)	19.	(a)	20.	(a)	21.	(a)	22.	(c)	23.	(d)	24.	(d)
25.	(c)	26.	(c)	27.	(a)	28.	(b)	29.	(c)	30.	(c)	31.	(d)	32.	(a)
33.	(a)	34.	(d)	35.	(c)	36.	(a)	37.	(a)	38.	(a)	39.	(d)	40.	(b)
41.	(b)	42.	(c)	43.	(d)	44.	(b)	45.	(a)	46.	(b)	47.	(b)	48.	(c)
49.	(a)	50.	(c)	51.	(b)	52.	(a)	53.	(b)	54.	(c)	55.	(c)	56.	(a)
57.	(b)	58.	(a)	59.	(b)	60.	(a)	61.	(a)	62.	(d)	63.	(b)	64.	(b)
65.	(d)	66.	(c)	67.	(c)	68.	(b)	69.	(c)	70.	(a)	71.	(b)	72.	(b)
73.	(b)	74.	(b)	75.	(a)	76.	(a)	77.	(b)	78.	(b)	79.	(b)	80.	(b)
81.	(d)	82.	(a)	83.	(b)	84.	(c)	85.	(a)	86.	(d)	87.	(d)	88.	(b)
89.	(c)	90.	(a)	91.	(d)	92.	(c)	93.	(a)	94.	(d)	95.	(c)	96.	(c)
97.	(c)	98.	(b)	99.	(b)	100.	(a)	101.	(a)	102.	(b)	103.	(c)	104.	(c)
105.	(c)	106.	(b)	107.	(c)	108.	(b)	109.	(c)	110.	(b)	111.	(c)	112.	(d)
113.	(c)	114.	(c)	115.	(b)	116.	(d)	117.	(b)	118.	(c)	119.	(d)	120.	(d)
121.	(b)	122.	(d)	123.	(c)	124.	(c)	125.	(a)	126.	(b)	127.	(a)	128.	(c)
129.	(d)	130.	(d)	131.	(a)	132.	(c)	133.	(a)	134.	(d)	135.	(a)	136.	(c)
137.	(b)	138.	(d)	139.	(b)	140.	(c)	141.	(d)	142.	(b)	143.	(b)	144.	(d)
145.	(a)	146.	(a)	147.	(c)	148.	(a)	149.	(d)	150.	(b)	151.	(c)	152.	(c)
153.	(d)	154.	(a)	155.	(c)	156.	(b)	157.	(d)	158.	(b)	159.	(b)	160.	(b)
161.	(a)	162.	(a)	163.	(b)	164.	(d)	165.	(b)	166.	(a)	167.	(b)	168.	(a)
169.	(b)	170.	(d)	171.	(c)	172.	(b)	173.	(d)	174.	(b)	175.	(a)	176.	(a)
177.	(c)	178.	(c)	179.	(d)	180.	(c)	181.	(b)	182.	(b)	183.	(b)	184.	(c)
185.	(a)	186.	(b)	187.	(a)	188.	(c)	189.	(c)	190.	(a)	191.	(d)	192.	(d)
193.	(b)	194.	(c)	195.	(b)	196.	(d)	197.	(a)	198.	(b)	199.	(c)	200.	(d)
201.	(c)	202.	(d)	203.	(a)	204.	(d)	205.	(d)	206.	(b)	207.	(a)	208.	(c)
209.	(a)	210.	(b)	211.	(d)	212.	(b)	213.	(b)	214.	(b)	215.	(a)	216.	(b)
217.	(d)	218.	(c)	219.	(c)	220.	(b)	221.	(c)	222.	(a)				

Explanations

1. (c)

For impulse input,

$$G(s) = \frac{1}{s+2}$$

and $$C(s) = \frac{1}{(s+2)^2}$$

Now, $$C(s) = R(s)\, G(s)$$

i.e. $$\frac{1}{(s+2)^2} = R(s) \times \frac{1}{s+2}$$

$$R(s) = \frac{1}{(s+2)}$$

Then, $$r(t) = e^{-2t}\, u(t)$$

7. (d)

$$\begin{bmatrix} Z_1 + Z_3 & -Z_3 \\ -Z_3 & Z_2 + Z_3 + Z_4 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} V_i(s) \\ 0 \end{bmatrix}$$

$$\therefore\ I_2(s) = \frac{\begin{bmatrix} Z_1 + Z_3 & V_i(s) \\ -Z_3 & 0 \end{bmatrix}}{Z_1Z_2 + Z_1Z_3 + Z_1Z_4 + Z_2Z_3 + Z_3^2 + Z_3Z_4 - Z_3^2}$$

$$= \frac{V_i(s)\, Z_3}{Z_1Z_2 + Z_1Z_3 + Z_1Z_4 + Z_2Z_3 + Z_3Z_4}$$

$$\therefore\ V_0(s) = I_2(s) Z_4$$

$$= \frac{V_i(s) Z_3 Z_4}{Z_1Z_2 + Z_1Z_3 + Z_1Z_4 + Z_2Z_3 + Z_3Z_4}$$

$$\frac{V_o(s)}{V_i(s)} = \frac{Z_3 Z_4}{Z_1Z_2 + Z_1Z_3 + Z_1Z_4 + Z_2Z_3 + Z_3Z_4}$$

and from signal flow graph

$$\frac{V_o(s)}{V_i(s)} = \frac{G_1 G_2 G_3}{1 - G_2 H}$$

and $1 - G_2H = Z_1Z_2 + Z_1Z_3 + Z_1Z_4 + Z_2Z_3 + Z_3Z_4$

only (d) satisfied this criterion.

8. (b)

$$T(s) = \frac{G(s)}{1 + G(s)} = \frac{s+4}{s^2 + 7s + 13}$$

$$G(s)\,[s^2 + 7s + 13 - s - 4] = s + 4$$

$$G(s) = \frac{s+4}{s^2 + 6s + 9}$$

for, d. c. gain, $s = 0$

$$G(0) = \frac{4}{9}$$

9. (b)

$$c(t) = t^2 e^{-t}$$

$$c(s) = \frac{2}{(s+1)^3}\ ;\ R(s) = \frac{1}{s}$$

Then, $$H(s) = \frac{(1s)}{R(s)} = \frac{(2s)}{(s+1)^3}$$

10. (a)

The transfer function

$$\frac{V_0}{V_s} = \frac{10^3}{1 - 10^3 B} = 100, \text{ (given)}$$

$$\therefore\ \beta = -9 \times 10^{-3}$$

11. (c)

Laplace transform $F(s)$ of a function $f(t)$ is given by

$$F(s) = \frac{10s(s+7)}{(s+1)(s+8)(s+10)}$$

Final value of $f(t)$

$$\lim_{t \to \infty} f(t) = \lim_{s \to 0} sF(s)$$

$$= \lim_{s \to 0} \frac{10s(s+7)}{(s+1)(s+8)(s+10)}$$

$$= 0$$

12. (d)

For system (b) closed loop transfer function

$$\frac{G}{s+1} + 1 = \frac{G + s + 1}{s+1}$$

$$\frac{G + s + 1}{s+1} = \frac{s+2}{s+1}$$

Hence $G = 1$.

13. (d)

$$L_1 = -bc,\ L_2 = -fg,\ L_3 = -jgi,\ L_1L_3 = bcfg$$

$$\Delta = 1 - (-bc - fg - jgi) + bcfg$$

$$= 1 + bc + fg + jgi + bcfg.$$

14. (b)

By putting $R(s) = 0$

$$P_1 = -H_2G_1,\ L_1 = -G_1H_2H_1,\ \Delta_1 = 1$$

$$T_n(s) = \frac{-H_2G_1}{1 + G_1H_2H_1}$$

if $|G_1H_2H_1| >> 1$, $T_n(s) = \dfrac{-H_2G_1}{G_1H_2H_1} = \dfrac{-1}{H_1}$

UNIT
3

Electronic Devices & Circuits

1. Semi-conductor Physics

Q.1 Diffusion of impurities in a semiconductor is carried out in a furnace through which a steady stream of impurity atoms is passed during the entire diffusion process. What would be the type of profile of the impurity atoms inside the semiconductor?
(a) Linear
(b) Gaussian
(c) Complementary error function
(d) Exponential

Q.2 The reverse current of a silicon diode is
(a) Highly bias voltage sensitive
(b) Highly temperature sensitive
(c) Both bias voltage and temperature sensitive
(d) Independent of bias voltage and temperature

Q.3 In switching diode fabrication, a dopant is introduced into silicon which introduces additional trap levels in the material thereby reducing the mean life time of carriers. This dopant is
(a) Aluminium (b) Platinum
(c) Gold (d) Copper

Q.4 The internal resistance of a current source used in the model of a BJT while analyzing a circuit using BJT is
(a) Very high
(b) Very low
(c) Zero
(d) Of the order of a few mega-ohms

Q.5 Given that the band gap of cadmium sulphide is 2.5 eV, the maximum photon wavelength, for electron-hole pair generation will be
(a) 4968 μm (b) 496 μm
(c) 4968 Å (d) 496 Å

Q.6 A semiconductor is irradiated with light such that carriers are uniformly generated throughout its volume. The semiconductor is n-type with $N_D = 10^{19}$ per cm^3. If the access electron concentration in the steady state is $\Delta n = 10^{15}$ per cm^3 and if $\tau_p = 10\ \mu$sec (minority carrier life time) the generation rate due to irradiation
(a) is 10^{20} e-h pairs/cm^3/sec
(b) is 10^{24} e-h pairs/cm^3/sec
(c) is 10^{10} e-h pairs/cm^3/sec
(d) cannot be determined as the given data is insufficient

Q.7 The drift velocity of electrons, in silicon
(a) is proportional to the electric field for value of electric field
(b) is independent of the electric field
(c) increases at low values of electric field and decreases at high value of electric field exhibiting negative differential resistance
(d) increases linearly with electric field at low value of electric field and gradually saturates at higher values of electric field

Q.8 The diffusion potential across a p-n junction
(a) decreases with increasing doping concentration
(b) increases with decreasing doping concentration
(c) does not depend on doping concentration
(d) increases with increasing in doping concentration

Q.9 A long specimen of p-type semiconductor material
(a) is positively charged
(b) is electrically neutral
(c) has an electrical field directed along its length
(d) acts as a dipole

Q.10 If an intrinsic semiconductor is doped with a very small amount of boron, then in the extrinsic semiconductor set formed, the number of electrons and holes will
(a) decrease
(b) increase and decrease respectively
(c) increase
(d) decrease and increase respectively

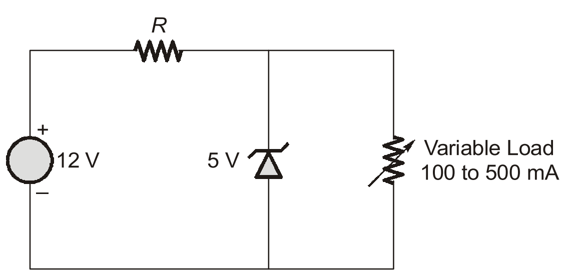
UNIT 4

Analog Circuits

1. Diode Circuits

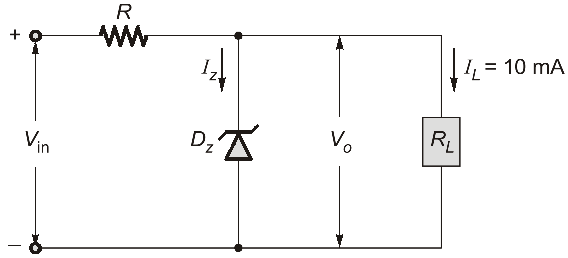
Q.1 A DC power supply has a no-load voltage of 30 V, and a full-load voltage of 25 V at a full-load current of 1 A. Its output resistance and load regulation, respectively, are
(a) 5 Ω and 20% (b) 25 Ω and 20%
(c) 5 Ω and 16.7% (d) 25 Ω and 16.7%

Q.2 In the voltage regulator shown in the figure below, the load current can vary from 100 mA to 500 mA. Assuming that the Zener diode is ideal (i.e., the Zener knee current is negligibly small and Zener resistance is zero in the breakdown region), the value of R is



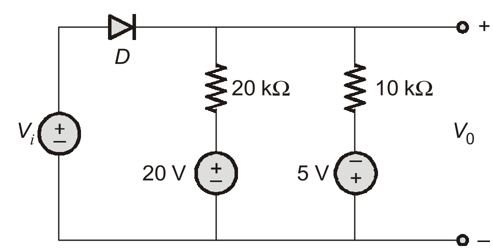
(a) 7 Ω (b) 70 Ω
(c) $\frac{70}{3}$ Ω (d) 14 Ω

Q.3 A Zener diode regulator in the figure is to be designed to meet the specifications: I_L = 10 mA, V_0 = 10 V and V_{in} varies from 30 V to 50 V. The Zener diode has V_z = 10 V and I_{zk} (knee current) = 1 mA. For satisfactory operation

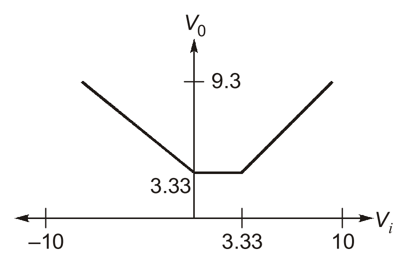


(a) $R \leq 1818$ Ω
(b) 2000 Ω $\leq R \leq$ 2200 Ω
(c) 3700 Ω $\leq R \leq$ 4000 Ω
(d) R > 4000 Ω

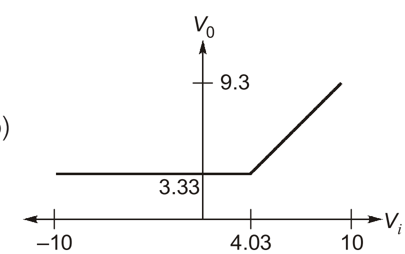
Q.4 For the circuit in the figure below, let cut-in voltage V_γ = 0.7 V.
The plot of V_o verses V_i for $-10 \leq V_i \leq 10$ V is



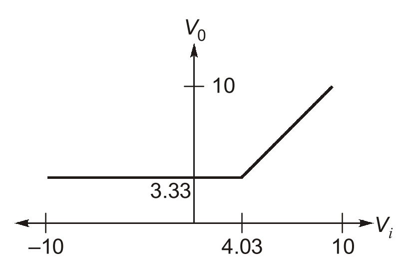
(a)



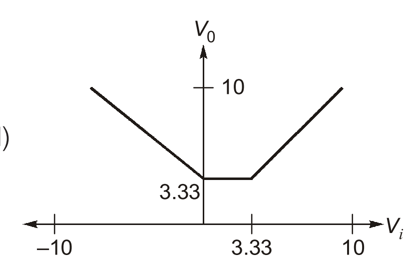
(b)



(c)



(d)

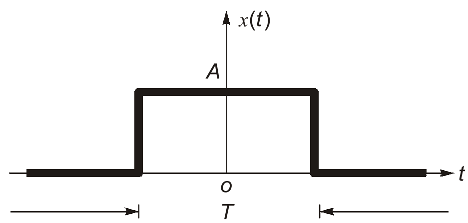


UNIT 5

Signals and Systems

1. Basic of Signal and Systems

Q.1 What is the total energy of the rectangular pulse shown in figure below?



(a) AT (b) A^2T
(c) A^2T^2 (d) AT^2

Q.2 Which one of the following is the impulse response of the system whose step response is given as $c(t) = 0.5(1 - e^{-2t})\, u(t)$?
(a) $e^{-2t}\, u(t)$ (b) $0.5\,\delta(t) + e^{-2t}u(t)$
(c) $0.5\, e^{-2t}\, u(t)$ (d) $0.5\,\delta(t) - 0.5\, e^{-2t}u(t)$

Q.3 A system with an input $x(t)$ and output $y(t)$ is described by the relation: $y(t) = tx(t)$. This system is
(a) Linear and time-invariant
(b) Linear and time varying
(c) None-linear and time invariant
(d) Non-linear and time varying

Q.4 The signal $x(t) = A\cos(\omega t + \phi)$ is
(a) an energy signal
(b) a power signal
(c) an energy as well as a power signal
(d) Neither an energy nor a power signal

Q.5 The system $y(t) = tx(t) + 4$ is
(a) non-linear, time-varying and unstable
(b) linear, time-varying and unstable
(c) non-linear, time invariant and unstable
(d) non-linear, time-varying and stable

Q.6 The signal $x(t)$ is a real and odd function of 't' the $x(\omega)$ is
(a) a real and even function of ω
(b) an imaginary and odd function of ω
(c) an imaginary and even function of ω
(d) a real and odd function of ω

Q.7 The discrete time system described by $y(n) = x(n^2)$, is
(a) Causal, linear and time varying
(b) Causal, linear and time invariant
(c) Non causal, linear and time varying
(d) Non causal, linear and time invariant

Q.8 What is the power and energy of the unit step sequence $u(n)$ respectively:
(a) ∞, 0 (b) 0, ∞
(c) $\frac{1}{2}$, 0 (d) $\frac{1}{2}$, ∞

Q.9 The discrete time signal is defined by

$$x(n) = \begin{cases} 1, & n = 1 \\ -1, & n = -1 \\ 0, & n = 0 \text{ and } |n| > | \end{cases}$$

If, $y(n)$ defined by $y(n) = x(n) + x(-n)$, then the value of $y(n)$ is
(a) 0 (b) 1
(c) 2 (d) ∞

Q.10 In memoryless system
(a) zero state response is zero
(b) zero input response is zero
(c) both response are zero
(d) both response are finite

Q.11 Let $\delta(t)$ is the delta function the value of integral

$$\int_{-\infty}^{+\infty} \delta(t)\cos\left(\frac{3t}{2}\right) dt \text{ is}$$

(a) 1 (b) -1
(c) 0 (d) $\frac{\pi}{2}$

Q.12 If a signal $f(t)$ has energy 'E' the energy of the signal $f(2t)$ is equal to
(a) E (b) $\frac{E}{2}$
(c) $2E$ (d) $4E$