A.C.f. & F.R.O.–2018

पुस्तिका में पृष्ठों की संख्या : 16
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Time : 3.00 Hours

प्रश्न-पत्र पुस्तिका संख्या /
Question Paper Booklet No. 2121

Exam Date:- 23.02.21
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Paper - III

अधिकतम अंक : 200
Maximum Marks : 200

प्रश्न–पत्र पुस्तिका एवं उत्तर पत्रक के पेपर सील/पॉलिथीन बैग को खोलने पर परीक्षार्थी यह सुनिश्चित कर लें कि उसके प्रश्न–पत्र पुस्तिका पर वही प्रश्न–पत्र पुस्तिका संख्या अंकित है जो उत्तर पत्रक पर अंकित है । इसमें कोई भिन्नता हो तो परीक्षार्थी वीक्षक से दूसरा प्रश्न–पत्र प्राप्त कर लें । ऐसा सुनिश्चित करने की जिम्मेदारी अभ्यर्थी की होगी ।

On opening the paper seal/polythene bag of the Question Paper Booklet the candidate should ensure that Question Paper Booklet No. of the Question Paper Booklet and Answer Sheet must be same. If there is any difference, candidate must obtain another Question Paper Booklet from Invigilator. Candidate himself shall be responsible for ensuring this.

परीक्षार्थियों के लिए निर्देश

1. **सभी** प्रश्नों के उत्तर दीजिए ।
2. **सभी** प्रश्नों के अंक समान हैं ।
3. प्रत्येक प्रश्न का केवल **एक** ही उत्तर दीजिए ।
4. एक से अधिक उत्तर देने की दशा में प्रश्न के उत्तर को गलत माना जाएगा ।
5. प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं, जिन्हें क्रमशः 1, 2, 3, 4 अंकित किया गया है । अभ्यर्थी को सही उत्तर निर्दिष्ट करते हुए उनमें से केवल एक गोले अथवा बबल को उत्तर पत्रक पर **नीले बॉल प्वाइंट पेन** से गहरा करना है ।
6. **OMR** उत्तर पत्रक इस परीक्षा पुस्तिका के अन्दर रखा है । जब आपको परीक्षा पुस्तिका खोलने को कहा जाए, तो उत्तर-पत्रक निकाल कर ध्यान से केवल **नीले बॉल पॉइंट पेन** से विवरण भरें ।
7. **प्रत्येक गलत उत्तर के लिए प्रश्न अंक का 1/3 भाग काटा जायेगा ।** गलत उत्तर से तात्पर्य अशुद्ध उत्तर अथवा किसी भी प्रश्न के एक से अधिक उत्तर से है । किसी भी प्रश्न से संबंधित गोले या बबल को खाली छोड़ना गलत उत्तर नहीं माना जायेगा ।
8. मोबाइल फोन अथवा इलेक्ट्रोनिक यंत्र का परीक्षा हॉल में प्रयोग पूर्णतया वर्जित है । यदि किसी अभ्यर्थी के पास ऐसी कोई वर्जित सामग्री मिलती है तो उसके विरुद्ध आयोग द्वारा नियमानुसार कार्यवाही की जायेगी ।
9. कृपया अपना रोल नम्बर ओ.एम.आर. पत्रक पर सावधानीपूर्वक सही भरें । गलत अथवा अपूर्ण रोल नम्बर भरने पर **5 अंक** कुल प्राप्तांकों में से काटे जा सकते हैं ।

चेतावनी : अगर कोई अभ्यर्थी नकल करते पकड़ा जाता है या उसके पास से कोई अनधिकृत सामग्री पाई जाती है, तो उस अभ्यर्थी के विरुद्ध पुलिस में प्राथमिकी दर्ज कराते हुए विविध नियमों-प्रावधानों के तहत कार्यवाही की जाएगी । साथ ही विभाग ऐसे अभ्यर्थी को भविष्य में होने वाली विभाग की समस्त परीक्षाओं से विवर्जित कर सकता है ।

INSTRUCTIONS FOR CANDIDATES

1. Answer **all** questions.
2. **All** questions carry equal marks.
3. Only **one** answer is to be given for each question.
4. If more than one answers are marked, it would be treated as wrong answer.
5. Each question has four alternative responses marked serially as **1, 2, 3, 4**. You have to darken only one circle or bubble indicating the correct answer on the Answer Sheet using **BLUE BALL POINT PEN**.
6. The **OMR** Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars carefully with **blue ball point pen** only.
7. **1/3 part of the mark(s) of each question will be deducted for each wrong answer.** A wrong answer means an incorrect answer or more than one answers for any question. Leaving all the relevant circles or bubbles of any question blank will not be considered as wrong answer.
8. Mobile Phone or any other electronic gadget in the examination hall is strictly prohibited. A candidate found with any of such objectionable material with him/her will be strictly dealt as per rules.
9. Please correctly fill your Roll Number in O.M.R. Sheet. **5 Marks** can be deducted for filling wrong or incomplete Roll Number.

Warning : If a candidate is found copying or if any unauthorized material is found in his/her possession, F.I.R. would be lodged against him/her in the Police Station and he/she would liable to be prosecuted. Department may also debar him/her permanently from all future examinations.

इस परीक्षा पुस्तिका को तब तक न खोलें जब तक कहा न जाए ।
Do not open this Test Booklet until you are asked to do so.

15-□

1. For a 20V Zener diode, if temperature is increased to 100°C (boiling point of water). The change in Zener potential will be
(Assume temperature coefficient = 0.072 %/°C and Room temperature = 25°C.
(1) 0.51 V (2) 4.12 V
(3) 1.08 V (4) 7.20 V

2. Match the following for the colour of light emitted by particular material of LED

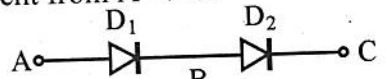
(I)	Red	(A)	GaN
(II)	Green	(B)	AlInGaP
(III)	Blue	(C)	GaP
(IV)	Yellow	(D)	GaAsP

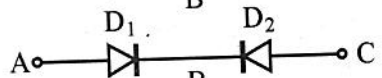
(1) I – A, II – B, III – C, IV – D
(2) I – D, II – C, III – A, IV – B
(3) I – C, II – D, III – A, IV – B
(4) I – D, II – A, III – B, IV – C

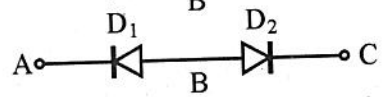
3. If the voltage gain without feedback is – 100 and feedback factor is –0.1, then calculate the input resistance with feedback for voltage series feedback, where input resistance without feedback is 10 kΩ,
(1) 110 kΩ (2) 0.9 kΩ
(3) 200 kΩ (4) 10 kΩ

4. Buck-Boost converter is one of the,
(1) AC – DC converter
(2) DC – AC converter/Inverter
(3) Controlled Rectifier
(4) DC – DC converter

5. DC choppers belong to the category of,
(1) DC – DC converter
(2) AC – DC converter
(3) Inverter
(4) AC – AC converter

6. As with other two-terminal devices, diodes can be placed in series (or in parallel). Determine which one of the following configurations can conduct current from A → C.
(1) 

(2) 

(3) 

(4) None of these

7. For harmonic distortion reading of D2 0.1, D3 0.02, and D4 0.01, with I_1 = 4A and R_C = 8Ω, calculate the total harmonic distortion (THD), fundamental power component (P_1), and total power (P).
(1) THD = 0.1; P_1 = 64 W and P = 64.64 W
(2) THD = 0.2; P_1 = 32 W and P = 32.32 W
(3) THD = 0.1; P_1 = 32 W and P = 32.32 W
(4) THD = 0.2; P_1 = 64 W and P = 64.32 W

8. Find the correct answer
(I) β (current gain) increases with increase in temperature
(II) V_{BE} decreases about 7.5 mV per degree Celsius (°C) increase in temperature
(III) I_{CO} (reverse saturation current) doubles for every 10°C increase in temperature
(1) Only (I) and (III) are correct
(2) (II) is correct and both (I) and (III) are wrong.
(3) (II) and (III) are correct
(4) All are correct

9. RC time constant of a clamper circuit should be

(1) Small enough that the capacitor will not discharge during non-conducting period of diode

(2) Large enough that the capacitor will discharge during non-conducting period of diode.

(3) Small enough that the capacitor will discharge during non-conducting period of diode

(4) Large enough that the capacitor will not discharge during non-conducting period of diode.

10. The transconductance of a bipolar transistor remains independent of the :

(1) Operating point

(2) Device dimensions

(3) Temperature

(4) Mode of operation like CE, CB, CC

11. Maximum drain current I_{DSS} for FET is defines when

(1) VGS = VDS and VDS > |VP|

(2) VGS ≠ 0 and VDS > |VP|

(3) VGS = 0 and VDS > |VP|

(4) VGS > 0 and VDS < |VP|

12. The decrease in base doping of the BJT would result in

(i) Increased emitter efficiency

(ii) Reduced emitter efficiency

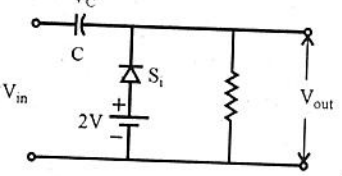
(iii) High magnitude of early voltage

(iv) Low magnitude of early voltage

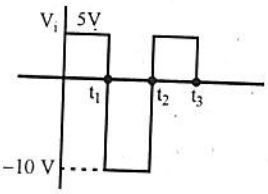
(1) (i) and (iii) (2) (i) and (iv)

(3) (ii) and (iv) (4) (ii) and (iii)

13. For given clamper circuit (Fig.1), find the value of output voltage between t_1 to t_2. Assume the input as shown in (Fig.2) and diode is Silicon diode.



(Fig. 1)



(Fig. 2)

(1) $V_o(t_1 - t_2) = 9.3$

(2) $V_o(t_1 - t_2) = 5.3$

(3) $V_o(t_1 - t_2) = 2.0$

(4) $V_o(t_1 - t_2) = 1.3$

14. For power amplifiers, which of the statements are correct.

(I) Class A : The output stage conducts for a full 360°

(II) Class B : The output stage each conduct for 180°

(III) Class C : The output voltage conducts for more than 180°.

(IV) Class B : The maximum efficiency is 78.5%

(1) I, II and III (2) II and III

(3) I, II and IV (4) I, II, III and IV

15. An op-amplifier based zero crossing detector converts sinusoidal waveform into a,

(1) Triangular waveform

(2) Impulse train

(3) Square waveform

(4) Cosine waveform

16. The nearest standard value of timing capacitor to produce a 100 μs output pulse from IC 555 along with timing resistor of 10 kΩ is,

(1) 100 nF (2) 1 μF

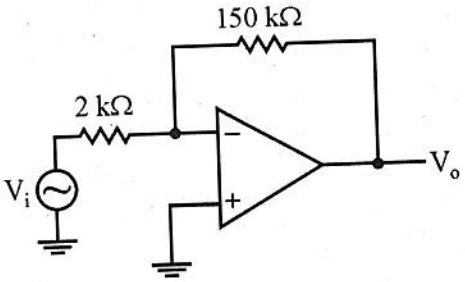
(3) 1 nF (4) 10 nF

17. A dc voltage supply provides 60 V when the output is unloaded. When connected to a load, the output drops to 56 V. The value of voltage regulation is,

(1) 40% (2) 6.6%

(3) 93.3% (4) 7.1%

18. Calculate the output offset voltage of the circuit shown below. The op-amp specification lists $V_{10} = 1.2$ mV.



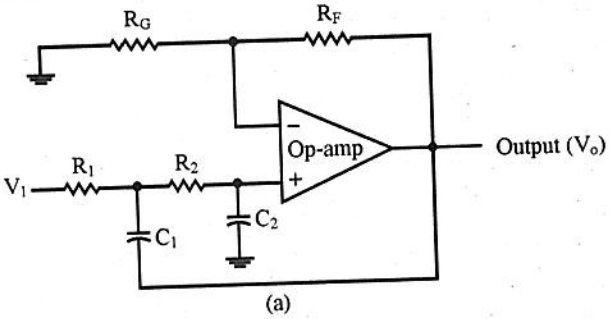
(1) V_o (Offset) = 45.6 mV

(2) V_o (Offset) = 38.8 mV

(3) V_o (Offset) = 91.2 mV

(4) V_o (Offset) = 0 mV

19. The circuit shown below behaves as :



(a)

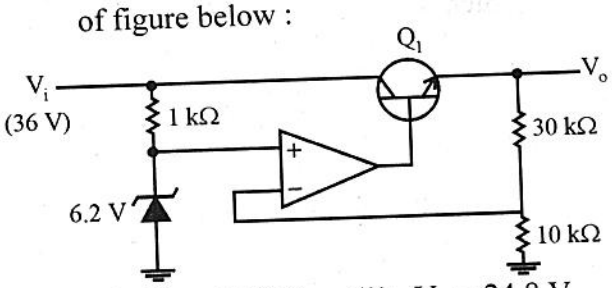
(1) Astable Multivibrator

(2) Second order Low Pass Filter

(3) Second order High Pass Filter

(4) First order Band Pass filter

20. Determine the regulated output voltage of figure below :



(1) $V_o = 14.8$ V (2) $V_o = 24.8$ V

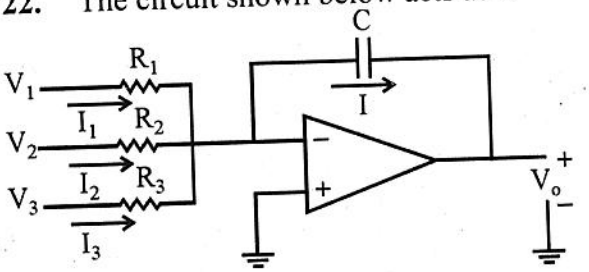
(3) $V_o = 36.0$ V (4) $V_o = 24.2$ V

21. Using a 10 nF capacitor, find the value of Resistor that yields an output pulse of 100 μs in the 555 time based monostable multivibrator.

(1) 5.6 kΩ (2) 2.8 kΩ

(3) 9.8 kΩ (4) 9.1 kΩ

22. The circuit shown below acts as a



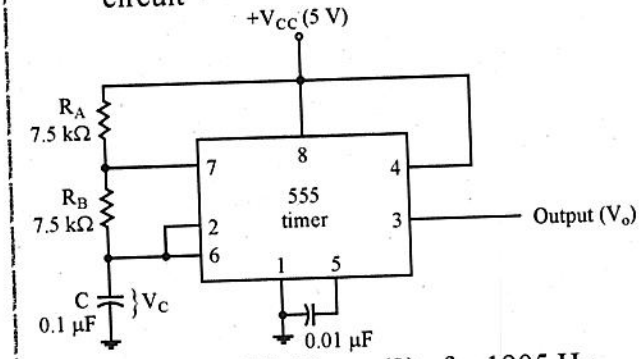
(1) Summing Integrator

(2) Summing Differentiator

(3) Antilogarithmic Amplifier

(4) Logarithmic Amplifier

23. Calculate the frequency of following circuit



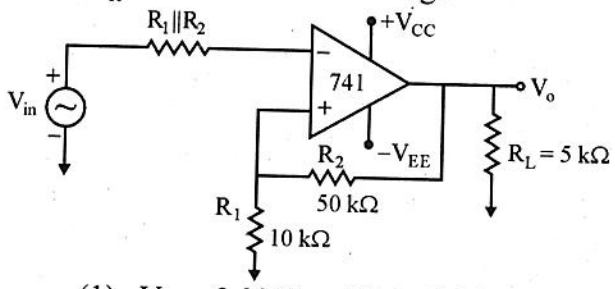
(1) f = 1270 Hz (2) f = 1905 Hz

(3) f = 635 Hz (4) f = 325 Hz

24. Which statement is not 'TRUE' with reference to switched capacitive filters ?
(1) High accuracy
(2) Excellent temperature stability
(3) Generate very less noise
(4) Low external component count

25. The IC series 7805, 7806, 7912 and 7915 is unique series due to
(1) All logic gate ICs
(2) All voltage regulator ICs
(3) All oscillator IC's
(4) All voltage comparator IC's

26. For given Schmitt trigger, find the upper threshold voltage, lower threshold voltage (Assume : the maximum output voltage swing is ± 14 V)
V_{ut} : upper threshold voltage
V_{lt} : lower threshold voltage

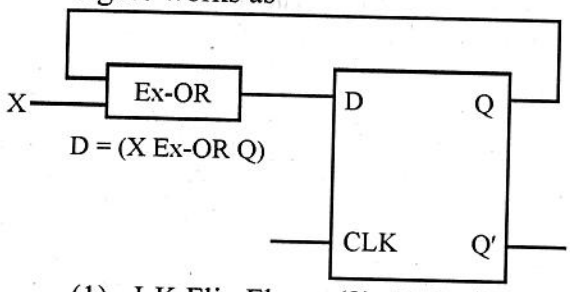


(1) $V_{ut} = 2.33$ V $V_{lt} = -2.33$ V
(2) $V_{ut} = 84$ V $V_{lt} = -84$ V
(3) $V_{ut} = 1.4\ \mu V$ $V_{it} = -1.4\ \mu V$
(4) $V_{ut} = 7.31$ V $V_{lt} = -7.31$ V

27. IC 74 HC00 series belong to,
(1) High Speed TTL IC
(2) High Speed CMOS IC
(3) Low power Schottkey TTL
(4) MSI family

28. A J-K Flip-Flop may be used as T – Flip-Flop by connecting,
(1) outputs to inputs in inverting mode
(2) both the inputs
(3) both the inputs using a inverter
(4) output to corresponding input

29. The digital circuit shown in the given figure works as

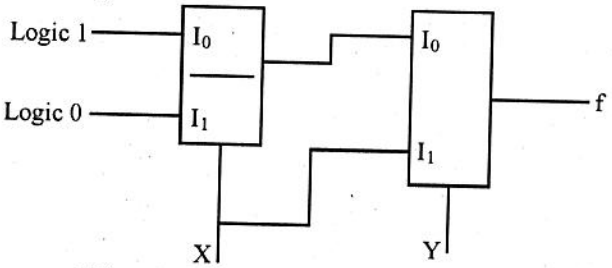


(1) J-K Flip Flop (2) R-S Flip Flop
(3) T Flip Flop (4) D Flip Flop

30. Let a denote number system radix. The value(s) of radix (r) that satisfy the equation
$\sqrt{144} = 12$, is/are
(1) Only 10 (2) 4
(3) Any value ≥ 5 (4) Only 12

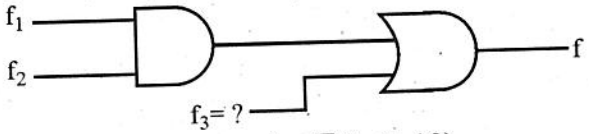
31. Consider the following function of four variables :
$F(A, B, C, D) = \sum (1, 2, 6, 7, 8, 9, 10, 11, 12, 13)$
(1) Independent of one variable
(2) Independent of two variables
(3) Independent of three variables
(4) Dependent on all the variables

32. Consider the circuit shown below with 2 : 1 Mux. The output f is given by



Where (') is the compliment of the variable.
(1) X'Y' + XY (2) X'Y + XY'
(3) X' + Y' (4) X + Y

33. Consider the logic circuit shown in figure below. The function f_1, f_2 and f (in canonical sum of products form in decimal notation) are



$f_1 = (w, x, y, z) = \Sigma(8, 9, 10)$

$f_2 = (w, x, y, z) = \Sigma(7, 8, 12, 13, 14, 15)$

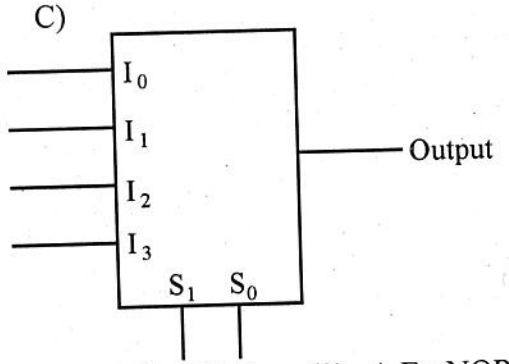
$f = (w, x, y, z) = \Sigma(8, 9)$

The function f_3 is

(1) $\Sigma(8)$ (2) $\Sigma(9)$
(3) $\Sigma(1, 8, 9)$ (4) $\Sigma(8, 10, 12)$

34. The following function was to be realized using 2-input AND Gate and OR Gate. However during the fabrication all 2-input AND were mistakenly substituted by 2-input NAND gates.
(A.B).C + (A'.C).D + (B.C).D + A.D
Where (') is the compliment of the variable.
What is the function finally realized ?
(1) A'+B'+C+D' (2) 0
(3) A'+B+C'+D' (4) 1

35. Output of the given 4×1 Multiplexer is Where $I_0 = I_1 = C$, $I_2 = I_3 = C'$, $S_1 = A$ and $S_0 = B$ (C' is the compliment of C)



(1) A Ex-OR B (2) A Ex-NOR B
(3) A Ex-OR C (4) A Ex-NOR C

36. Which of the following is/are self-complementing code ?
(I) 84-2-1 code (II) Excess-3 code
(III) Gray code (IV) 2421 code
(1) Only I, II and IV
(2) Only III and IV
(3) Only II and III
(4) Only I, II and III

37. Which of the following is 'true' for an ECL circuit ?
(I) Switching speed is highest among commercially available logic families
(II) ECL logic block usually produces output and it's complement also
(III) Total current flow in an ECL remains relatively constant regardless of logic state
(IV) ECL also called Merged transistor logic
(1) II, III and IV (2) I, II and III
(3) I and IV (4) II and IV

38. The TTL NAND gate has high speed, low rise time and low fall time due to
(1) Inclusion of multiemitter transistor
(2) Use of diodes in circuit
(3) High input resistance
(4) Low output resistance

39. Which of the following memory needs refresh ?
(1) SRAM (2) DRAM
(3) ROM (4) All of these

40. In Intel 8085, which is the first machine cycle of an instruction ?
(1) A memory read cycle
(2) A memory write cycle
(3) An OP-Code fetch cycle
(4) An I/O read cycle

41. Which of the following instruction is not possible in 8085 ?
(1) POP PSW (2) POP B
(3) POP D (4) POP 30H

42. Match List-I (Pre terminals) with List-II (Applications) and select the correct answer using the code given below the lists :

	List-I		List-II
P.	SID, SOD	i.	Wait State
Q.	Ready	ii.	Interrupt
R.	TRAP	iii.	Serial data transfer
S.	ALE	iv.	Memory or I/O read/write
		v.	Address latch control

Codes :

	P	Q	R	S
(1)	iii	i	v	ii
(2)	iii	i	ii	v
(3)	iv	iii	ii	v
(4)	iv	iii	i	ii

43. Consider the following 8085 instructions :

```
MVI   A, A9H
MVI   B, 57H
ADD   B
ORA   A
```

The flag status (S, Z, CY) after the instruction ORA A is executed, is

(1) (0, 1, 1) (2) (0, 1, 0)
(3) (1, 0, 0) (4) (1, 0, 1)

44. Consider the following 8085 instructions :

```
XRA   A
MVI   B, 4AH
SUI   4FH
ANA   B
HLT
```

The contents of register A and B are respectively

(1) 05, 4A
(2) 4F, 00
(3) B1, 4A
(4) None of these

45. Consider the following loop.

```
      XRA   A
      LXI   B, 0007H
LOOP: DCX   B
      JNZ   LOOP
```

This loop will be executed

(1) 1 times (2) 8 times
(3) 7 times (4) infinite times

46. An 8085 μP based system drives a multiplexed 5-digits 7-segments display. The digits are refreshed at a rate of 500 Hz. The ON time for each digit is

(1) 4 ms (2) 0.4 ms
(3) 10 ms (4) 25 ms

47. Which one of the following is NOT a vectored interrupted ?

(1) TRAP (2) INTR
(3) RST 3 (4) RST 7.5

48. Determine the number of times, the following loop is executed ?

```
      MVI   A, 17H
LOOP  ORA   A
      RAL
      JNC   LOOP
```

(1) Infinite
(2) 1
(3) Infinite or just once, if the flag is set initially
(4) 4

49. Identify the mathematical function that is performed by the following instructions.

```
MVI A, 07H
RLC
MOV, B, A
RLC
RLC
ADD B
```

(1) Multiply by 12
(2) Multiply by 10
(3) Divide by 12
(4) Divide by 10

50. In 8085 μp, various addressing modes are used to access the data. Match the following instructions with use of correct addressing modes.

I.	LDAX	P.	Direct
II.	XCHG	Q.	Register Indirect
III.	MVI	R.	Implied
IV.	LHLD	S.	Immediate

(1) I – Q, II – R, III – S, IV – P
(2) I – R, II – Q, III – S, IV – P
(3) I – P, II – Q, III – S, IV – R
(4) I – P, II – R, III – S, IV - Q

51. In control system, when maximum value is subtracted from step value and result is divided by step value, result is called.
(1) % undershoot (2) % overshoot
(3) % undamped (4) % overdamped

52. A frequency where Bode magnitude plot changes slope is called,
(1) start frequency
(2) break frequency
(3) ripple frequency
(4) Bode frequency

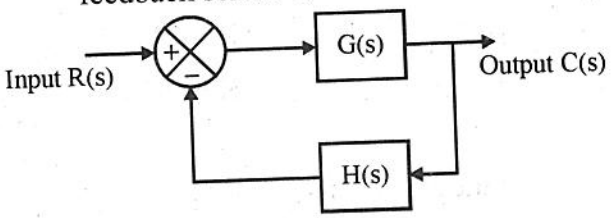
53. For a second order system as ξ is increased from zero the response becomes
(1) Zero
(2) Infinity
(3) Progressively less oscillatory
(4) Progressively more oscillatory

54. The system is said to be completely state controllable if it is possible to transfer the state from
(1) Any initial state $x(t_0)$ to any desired state x(t) in specified finite time
(2) Any initial state $x(t_0)$ to any desired state x(t) in specified infinite time
(3) Both Any initial state $x(t_0)$ to any desired state x(t) in specified finite time and Any initial state $x(t_0)$ to any desired state x(t) in specified infinite time
(4) None of these

55. A unity feedback control system has an open loop transfer function of $G(s) = \frac{2(s+8)}{s(s+2)}$; calculate steady state error for unit ramp input
(1) 0.125 (2) 10.25
(3) 12.5 (4) 0.0125

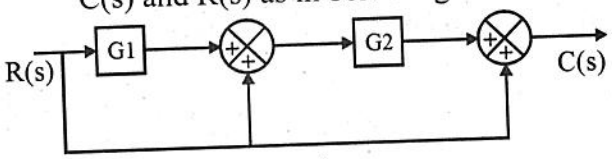
56. Two identical first order systems have been cascaded non-interactively. The unit step response of the system will be
(1) Over-damped
(2) Under-damped
(3) Undamped
(4) Critically damped

57. Find out the sensitivity of a closed loop system with respect to H, the feedback sensor is



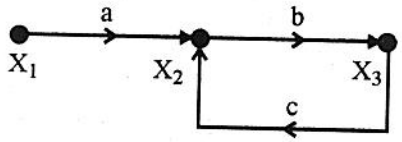
(1) Zero (2) One
(3) $\frac{1}{1+GH}$ (4) $\frac{-GH}{1+GH}$

58. Find out the transfer function relating C(s) and R(s) as in below figure



(1) $G_1G_2 - G_2 + 1$
(2) $G_1G_2 + G_2 + 1$
(3) $-G_1G_2 - G_2 + 1$
(4) $\frac{G1G2+1}{1+G2}$

59. Find out overall transmittance by signal flow graph technique in given figure



(1) ab+c (2) abc+c

(3) $\frac{ab}{1-ab}$ (4) $\frac{ab}{1-bc}$

60. The open-loop transfer function of a unity feedback control system is

$$G(s) = \frac{K}{S\,[S\,(S+4)+2T]}$$

Identify the appropriate relation between K and T for the system to remain "stable"

(1) $0 < K < 4T$ (2) $0 < K < 2T$

(3) $0 < K < 8T$ (4) $0 < K < T/2$

61. Which of the statements are 'true'

I. Lead compensation speed ups the response of the system.

II. Lag compensation improves the steady-state accuracy of the system

III. Lag compensator increases the speed of the system

IV. The Lead-Lag compensator improves transient response, stability and steady-state response.

(1) I, II and III (2) I, II and IV

(3) II, III and IV (4) II and III

62. A linear time-invariant system is defined by following state variable model

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}-1 & 0\\ 0 & -2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}0\\ 1\end{bmatrix} u$$

$$y = \begin{bmatrix}1 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$$

Identify "CORRECT" statements for above system

I. The system is completely controllable

II. The system is not completely controllable

III. The system is completely observable

IV. The system is not completely observable

(1) I and III (2) I and IV

(3) II and III (4) II and IV

63. A system has a single pole at origin, its impulse response will be,

(1) Constant

(2) Ramp

(3) Decaying Exponential

(4) Oscillatory

64. The current leads supply voltage if a series resonant circuit exhibits its operation ____ the resonant frequency.

(1) above (2) below

(3) equal to (4) None of these

65. What would be the value of power factor for series RLC circuit under the resonance phenomena ?

(1) 0.5 (2) 1

(3) Infinity (4) 0

66. Find the Thevenin equivalent circuit for a dc power supply that has a 30V terminal voltage when delivering 400 mA and a 27V terminal voltage delivering 600 mA,

(1) $V_{Th} = 30V$, $R_{Th} = 1\ k\Omega$

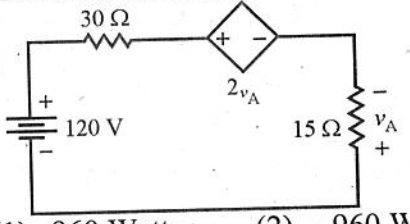
(2) $V_{Th} = 36V$, $R_{Th} = 100\ \Omega$

(3) $V_{Th} = 27V$, $R_{Th} = \infty$

(4) $V_{Th} = 36V$, $R_{Th} = 15\ \Omega$

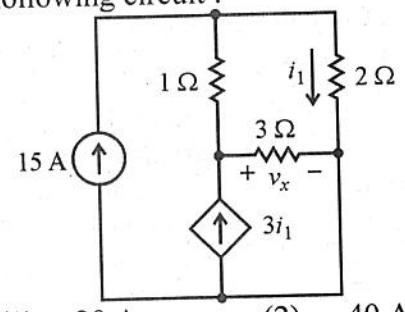
67. For parallel RLC circuit, which one of the following statement is NOT true ?
(1) The bandwidth of the circuit decreases if R is increased
(2) The bandwidth of the circuit remain same if L is increased
(3) At response, input impedance is a real quantity
(4) At resonance, the magnitude of the input impedance attains its minimum value

68. Compute the power absorbed in dependent voltage source for the circuit shown below.



(1) 960 Watt (2) –960 Watt
(3) 1920 Watt (4) –1920 Watt

69. Determine the value of i_1 in the following circuit :

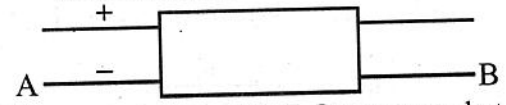


(1) –20 A (2) – 40 A
(3) – 25 A (4) – 22 A

70. Which of the following statement is incorrect ?
(1) Source transformations allow us to convert a practical voltage source into a practical current source, and vice versa.
(2) Repeated source transformations can greatly simplify analysis of a circuit.
(3) Maximum power transfer occurs when the load resistor matches the Thévenin equivalent resistance of the network to which it is connected.
(4) For nodal analysis, first make certain that the network is a planar network.

71. The nodal method of circuit analysis is based on
(1) KVL and Ohm's Law
(2) KCL and Ohm's Law
(3) KVL, KCL and Ohm's Law
(4) KVL and KCL

72. With 10 V DC connected at port A in the linear nonreciprocal two port network shown below, the following were observed
(i) 1 Ω connected at port B draws a current of 3 A
(ii) 2.5 Ω connected at port B draws a current of 2 A



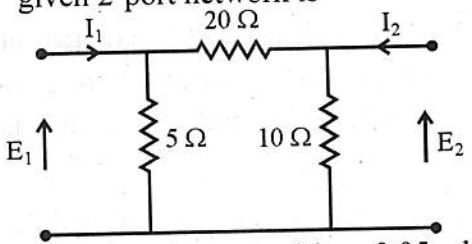
The current drawn by 7 Ω connected at port B
(1) 3/7 A (2) 5/7 A
(3) 1 A (4) 9/7 A

73. A two-port network is represented by ABCD parameters is given by

$$\begin{bmatrix} V_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} V_1 \\ -I_2 \end{bmatrix}$$

If port-2 is terminated by R_L, the input impedance seen at port-1 is given by
(1) $\frac{A + B_{RL}}{C + D_{RL}}$ (2) $\frac{B + A_{RL}}{D + C_{RL}}$
(3) $\frac{A_{RL} + B}{C_{RL} + D}$ (4) $\frac{D_{RL} + A}{B_{RL} + C}$

74. The admittance parameter Y_{12} in the given 2-port network is



(1) –20 mho (2) – 0.05 mho
(3) + 0.01 mho (4) – 0.20 mho

75. $x(t)$ is said to be an energy signal if and only if

(1) $0 < E < \infty$ and $P = \infty$

(2) $-\infty < E < \infty$ and $P = 0$

(3) $0 < E < \infty$ and $P = 0$

(4) $0 \leq E < \infty$ and $P \neq 0$

76. The Fourier transform of unit step function, U(t) is,

(1) $\pi\delta(\omega) + \frac{1}{j\omega}$ (2) $\pi\delta(\omega) - \frac{1}{j\omega}$

(3) $\pi\delta(\omega)$ (4) ∞

77. If the phase $\theta(\omega)$ of the system is linear, then the group delay of the system,

(1) increases with the frequency of the signal

(2) constant

(3) decreases with the frequency of the signal

(4) independent of frequency of signal

78. The impulse response h(t) of a LTI continuous time system is described by $h(t)\ \exp(\alpha t)u(t) + \exp(\beta t)u(-t)$ where u(t) is the unit step function, and α and β are real constants. This system is stable if

(1) α is positive and β is positive

(2) α is positive and β is negative

(3) α is negative and β is negative

(4) α is negative and β is positive

79. The impulse response of a continuous time system is given by $h(t) = \delta(t-1) + \delta(t-3)$.

The value of the step response at t=2 is

(1) 0 (2) 1

(3) 2 (4) 3

80. Consider the sequence $x[n] = a^n u[n] + b^n u[n]$, where u[n] denotes the unit step sequence and $0<|a|<|b|<1$. The region of convergence (ROC) of the z-transform of x[n] is

(1) $|z| > |a|$ (2) $|z| > |b|$

(3) $|z| < |a|$ (4) $|a| < |z| < |b|$

81. Let y(n) denote the convolution of h(n) and g(n), where $h(n) = (1/2)^n u(n)$ and g(n) is a casual sequence. If y(0)=1 and y(1) = ½, then g(1) equals

(1) 0 (2) 1/2

(3) 1 (4) 3/2

82. The first six point of the 8 point DFT of a real valued sequence are 5, 1- j3, 0, 3- j4, 0 and 3+ j4. The last two points of the DFT are respectively

(1) 0, 1−j3 (2) 0, 1+j3

(3) 1+j3, 5 (4) 1−j3, 5

83. Two systems $H_1(Z) = \frac{(1-0.4z^{-1})}{(1-0.6Z^{-1})}$ and $H_2(Z)$ are connected in cascade. The overall output y(n) is the same as the input x(n) with a unit delay. The transfer function of the second system $H_2(Z)$ is

(1) $\frac{(1-0.6z^{-1})}{Z^{-1}(1-0.4Z^{-1})}$

(2) $\frac{(1-0.4z^{-1})}{Z^{-1}(1-0.6Z^{-1})}$

(3) $\frac{Z^{-1}(1-0.6z^{-1})}{(1-0.4Z^{-1})}$

(4) $\frac{Z^{-1}(1-0.4z^{-1})}{(1-0.6Z^{-1})}$

84. A compact disc (CD) records audio signals digitally by means of a binary code (Assume audio signal BW = 15 kHz).

If the Nyquist samples are quantized into 65536 levels and then binary coded. The number of binary digits per second (bits/sec) required to encode the audio signal will be.....

(1) 480 K bits/sec

(2) 300 K bits/sec

(3) 240 K bits/sec

(4) 120 K bits/sec

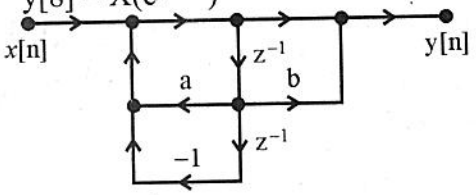
85. A system is described as

$$T(x[n]) = \sum_{k=n_0}^{n} x[k]$$

Identify the "CORRECT" characteristics for this

(1) Not casual, Linear, Not memory less
(2) Casual, Not linear, Not memoryless
(3) Not casual, linear, memoryless
(4) Casual, Not linear, memoryless

86. Consider the signal flow graph shown below. Let the input to the system $x[n]$ is an 8-point sequence.
Identify the value of a and b such that $y[8] = X(e^{j6\pi/8})$



(1) $a = \frac{1}{\sqrt{2}}, b = 1 - j$

(2) $a = -\sqrt{2}, b = \frac{1+j}{\sqrt{2}}$

(3) $a = \frac{1}{2}, b = 1 + j$

(4) $a = -2, b = \frac{1-j}{\sqrt{2}}$

87. The correct vector identity is,
(1) $\nabla \cdot VA = A \cdot \nabla V + A(\nabla \cdot V)$
(2) $\nabla \cdot VA = A \cdot \nabla V + V(\nabla \cdot A)$
(3) $\nabla \cdot VA = \nabla \cdot V + \nabla \cdot A$
(4) $\nabla \cdot VA = (\nabla \cdot V)(\nabla \cdot A)$

88. The skin depth, δ at a frequency of 1.6 MHz in aluminium, where σ = 38.2 MS/m and $\mu = 1$,
(1) 64.4 μm (2) 100.5 μm
(3) $\frac{1}{\sqrt{\pi}}$ μm (4) None of these

89. The Poynting vector, P is denoted by
(1) $\vec{E} \cdot \vec{H}$ (2) $\vec{E} \times \vec{H}$
(3) $\vec{E} / \vec{H}$ (4) $\vec{H} \times \vec{E}$

90. An airline has a characteristics impedance of 70 Ω and a phase constant of 3 rad/m at 100 MHz. What will be the inductance per metre of the line ?
(1) 252.4 nH/m (2) 314.8 nH/m
(3) 334.2 nH/m (4) 348.6 nH/m

91. For electrostatic fields in charge free atmosphere, which one of the following is correct ?
(1) $\nabla \times E = 0$ and $\nabla \cdot E = 0$
(2) $\nabla \times E \neq 0$ and $\nabla \cdot E = 0$
(3) $\nabla \times E = 0$ and $\nabla \cdot E \neq 0$
(4) $\nabla \times E \neq 0$ and $\nabla \cdot E \neq 0$

92. Two conducting coils 1 and 2 (identical except that 2 is split) are placed in a uniform magnetic field that decreases at a constant rate. I the plane of the coils is perpendicular to the field lines, which of the following statement is true ?
(1) An EMF is induced in both the coils.
(2) An EMF is induced in split the coil.
(3) Equal Joule heating occurs in both coils.
(4) All of these

93. Which of the following potential does not satisfy Laplace's Equation ?
(1) $V = 2x + 5$
(2) $V = 10xy$
(3) $V = \rho \cos\phi + 10$
(4) $V = r \cos\phi$

94. A wave guide operated below cut-off frequency can be used as
(1) A Phase shifter (2) An attenuator
(3) An Isolator (4) None of these

95. Two point charges -4μC and 5μC are located at (2, -1, 3) and (0, 4, -2) respectively. Find the potential at (1, 0, 1), assuming zero potential at infinity.

(1) −5.872 V (2) − 3.50 V
(3) 2.46 V (4) 1 V

96. Find, which statement is 'TRUE' for A vector field F

I. Solenoidal and irrotational if
$\nabla \cdot F = 0$ and $\nabla \times F = 0$

II. Solenoidal but not irrotational, if
$\nabla \cdot F \neq 0$ and $\nabla \times F = 0$

III. Irrotational but not solenoidal, if
$\nabla \times F \neq 0$ and $\nabla \cdot F \neq 0$

IV. Neither solenoidal nor irrotational, if
$\nabla \cdot F = 0$ and $\nabla \times F \neq 0$

(1) I only (2) II and IV
(3) I and III (4) I and II

97. The electric field of a uniform plane wave in free space is given by

$E_s = 10 (a_y + j a_z) e^{-j25x}$

Determine the frequency 'f'

(1) 2.4 GHz (2) 0.6 GHz
(3) 24 GHz (4) 1.2 GHz

98. A lossless transmission line is 100 cm long and operates at 400 MHz. The line parameters are L = 0.49 μ H/m and C = 100 pf. Find the phase constant and phase velocity.

(1) $\beta = 17.58$ rad/m, $V_P = 1.43 \times 10^8$ m/sec.
(2) $\beta = 8.79$ rad/m, $V_P = 2.85 \times 10^8$ m/sec.
(3) $\beta = 5.56$ rad/m, $V_P = 4.52 \times 10^8$ m/sec.
(4) $\beta = 170$ rad/m, $V_P = 1.47 \times 10^7$ m/sec.

99. A 0-25 A ammeter has a guaranteed accuracy of 1% of full scale reading. The current measured by this instrument is 10 A. The limiting error in % is,

(1) 25.0 % (2) 2.0 %
(3) 2.5 % (4) 1.0 %

100. An n-bit A/D converter is required to convert an analog input in the range of 0 – 5 V to an accuracy of 10 mV. The value of n should be,

(1) 8 (2) 10
(3) 16 (4) 9

101. The bolometer is a,

(1) humidity-sensitive element
(2) capacitive clement
(3) temperature-sensitive resistive element
(4) Sound-sensitive resistive element

102. A set of independent current measurement s was recorded as 10.03, 10.10, 10.11 and 10.08 A. Calculate the range of error.

(1) ± 0.04 A (2) ± 0.028 A
(3) ± 0.065 A (4) ± 0.033 A

103. Match List-I with List-II and select the correct answer :

	List – I		List-II
P.	Precision	i.	The smallest change in the input quantity which can be detected with its certainty.
Q.	Accuracy	ii.	Closeness of the reading with its true value.
R.	Resolution	iii.	Measurement of the reproducibility of the measurement.
S.	Static Sensitivity	iv.	Ratio of infinitesimal change sensitivity in output to infinitesimal change in input

	P	Q	R	S
(1)	ii	iii	i	iv
(2)	iii	ii	iv	i
(3)	iii	ii	i	iv
(4)	ii	iii	iv	i

104. In semiconductor strain gauges, when tensile strain is applied

(1) Resistance increases in N-type of materials

(2) Resistance increases in P-type of materials

(3) Resistance increases in both P and N-type of materials

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

105. A digital voltmeter uses an A/D converter which needs a start pulse, uses an analog comparator and has a relatively fixed conversion time independent of the applied voltage.

The A/D converters is

(1) Successive approximation converter

(2) Digital Ramp converter

(3) Divial slope converter

(4) All of these

106. In a Q meter, distributed capacitance of coil is measured by changing the capacitance of the tuning capacitor. The values of tuning capacitor are C_1 and C_2 for resonant frequencies f_1 and $2 f_1$ respectively. The value of distributed capacitance is :

(1) $(C_1 - C_2) / 2$

(2) $(C_1 - 2C_2) / 3$

(3) $(C_1 - 4C_2) / 3$

(4) $(C_1 - 3C_2) / 2$

107. In a differential amplifier using two FETs, a resistance has to be used to reduce the meter current to zero even when no voltage is applied to the circuit. This is necessitated on account of :

(1) Mismatches between the characteristics of the FETs

(2) Difference between tolerance values of resistors used in the circuit even though they are marked nominally equal

(3) Variations in the operating voltage of the circuit.

(4) Both Mismatches between the characteristics of the FETs and Difference between tolerance values of resistors used in the circuit even though they are marked nominally equal

108. Identify the "CORRECT" statements.

I. Loading effect is primarily caused by instruments having low sensitivity.

II. Relative error is the difference between the measured value and the true value.

III. Resolution is small increment in measurand that can be detected with certainty by the instrument.

IV. Moving-coil permanent magnet instruments can be used for the measurements of AC and DC.

(1) I and IV (2) II and IV

(3) I and III (4) II and III

109. A variable reluctance type tachometer has 60 rotor teeth, the records 3600 counts / minutes. The device speed is

(1) 3600 r.p.s. (2) 7200 r.p.s.

(3) 1800 r.p.s. (4) 2400 r.p.s.

110. A thermistor has a resistance temperature coefficient of –2% over a temperature range of 25°C to 50°C. If the resistance is 50 Ω at 25°C, what is the resistance at 45°C ?

(1) 70 Ω (2) 20 Ω

(3) 15 Ω (4) 30 Ω

111. A depletion mode – MOSFET is characterized by a

(1) lightly doped channel between heavily doped source and drain

(2) heavily doped channel between lightly doped source and drain

(3) enhanced channel between source and drain

(4) lightly doped channel between drain and gate.

112. The solar cell is based on the principle of

(1) Photo emissive effect

(2) Photo conductive effect

(3) MOSFET

(4) Photo voltaic effect

113. A TRIAC is similar to

(1) two parallel connected thyristors

(2) two back to back (anti-parallel) connected thyristors

(3) thyristor with larger $\frac{dv}{dt}$ rating

(4) Bipolar Junction Transistor

114. What is the unit of sheet resistivity ?

(1) Ohms per centimeter

(2) Ohms-centimeter

(3) Ohms per square centimeter

(4) Ohms-square centimeter

115. The total current in a semiconductor is proportional to

(1) Gradient of Fermi potential

(2) Gradient of Fermi energy

(3) Gradient of surface potential

(4) Gradient of surface energy

116. Thin lightly doped intrinsic layer within p-i-n diode is used to

(1) Overcome the constraints imposed by high fields in a diode

(2) Overcome the constraints imposed by carrier doping in a diode

(3) Overcome the constraints imposed by depletion region in a diode

(4) Overcome the constraints imposed by temperature in a diode

117. Which of the following statement is true for a MOS capacitor ?

(I) The Fermi level stays flat within the silicon, since there is no net flow of conduction current.

(II) n-type surface is formed not by doping, but instead by inverting the original p-type substrate with an applied electric field.

(1) I is true and II is false.

(2) I and II both are true.

(3) II is true and I is false.

(4) I and II both are false.

118. Major source of noise in a photoconductor is

(1) Random thermal recombination

(2) Random thermal generation

(3) Random thermal motion of carriers

(4) Shot noise

119. Following equation represent the relation between the electron mobility (μ_n) and the diffusion coefficient (D_n) for semiconductor

(1) $D_n = \frac{kT}{q}\mu_n$ (2) $\mu_n = \frac{kT}{q}D_n$

(3) $D_n = \frac{kT}{q}\mu_n^2$ (4) $\mu_n = \frac{kT}{q}D_n^2$

120. The expression for the continuity equation for electron is given by

(1) $\frac{\partial \delta p}{\partial t} = \frac{-1}{q}\frac{\partial J_p}{\partial x} - \frac{\delta p}{\tau_p}$

(2) $\frac{\partial \delta n}{\partial t} = \frac{1}{q}\frac{\partial J_n}{\partial x} - \frac{\delta n}{\tau_n}$

(3) $\frac{\partial \delta n}{\partial t} = \frac{1}{q}\frac{\partial^2 \delta n}{\partial x^2} - \frac{\delta n}{\tau_n}$

(4) $\frac{\partial \delta n}{\partial t} = D_n\frac{\partial \delta n}{\partial x} - \frac{\delta n}{\tau_n}$

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