

**NATIONAL COUNCIL OF SCIENCE MUSEUMS**  
**KOLKATA**  
**APTITUDE TEST FOR SELECTION OF CURATOR - B**

Name -

Hall Ticket Number -

Discipline: Electronics

Date: 29.11.14

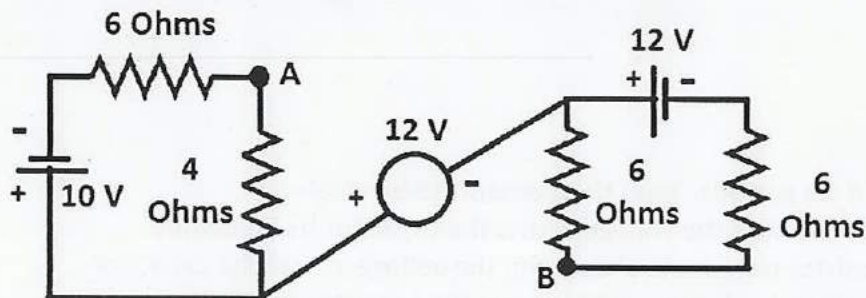
Duration: 2 Hours

Marks allotted 70 X 1 = 70

**SECTION – B**

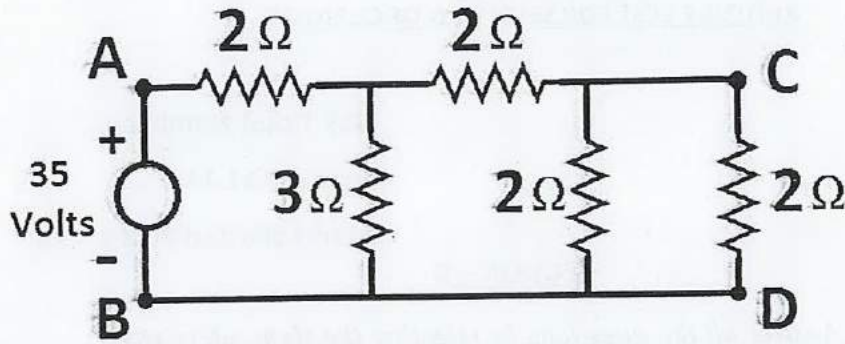
*Note: Answer all the questions by selecting the right alternative*

- The energy required to change the speed of one electron from rest to  $0.6c$  is nearly
  - 0.085Me V
  - 0.13Me V
  - 0.26Me V
  - 0.37Me V
- The current in a 0.2 Henry inductor varies at a rate of 5 Ampere per second. Find out the energy stored after a second.
  - 25 Joule
  - 2.5 Joule
  - 0.25 Joule
  - 0.025 Joule
- Which among the following statements is true in relation to ideal voltage source and practical voltage source-
  - Terminal voltage falls with increasing current in ideal source but not in practical
  - Terminal voltage increases with increasing current in ideal source but not in practical
  - Terminal voltage falls with increasing current in practical source but not in ideal
  - Terminal voltage falls with increasing current both in practical and ideal sources
- What is the voltage across A and B in the circuit given-

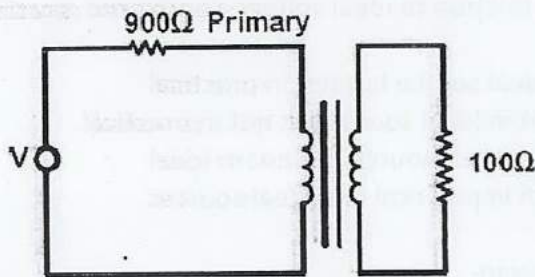


- 14 Volts
- 12 Volts
- 10 Volts
- 0 Volts

5. With respect to branches AB and CD state which among the following is true –



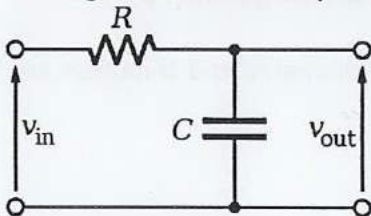
- Reciprocity theorem is valid
  - Reciprocity theorem is invalid
  - Reciprocity theorem is valid if resistors have different temperature coefficient
  - None of the above
6. Which one of the following is used as the principle photo detector in optical fiber link
- Avalanche diode
  - Varactor diode.
  - Semiconductor PIN diode
  - Zener diode
7. Consider the circuit shown in the given figure. For maximum power transfer to the load, the primary to secondary turn's ratio must be



- 9 : 1
  - 3 : 1
  - 1 : 3
  - 1 : 9
8. In a series RC circuit if we consider both the elements to be ideal–
- Voltage across the resistor lags the voltage across the capacitor by 90 degree
  - Voltage across the resistor remains in phase with the voltage across the capacitor
  - Voltage across the resistor leads the voltage across the capacitor by 45 degree
  - Voltage across the resistor leads the voltage across the capacitor by 90 degree
9. In case of series resonance and parallel resonance which among the following is true–
- In both the cases current peaks at resonant frequency
  - In none of the cases current peaks at resonant frequency
  - In parallel resonance current peaks at resonant frequency
  - In series resonance current peaks at resonant frequency



10. Q factor in case of a series resonant circuit can be defined as –
- The ratio of the voltage across the inductor to the voltage across capacitor
  - The ratio of the voltage across the capacitor to the voltage across inductor
  - The ratio of the voltage across the inductor or capacitor to the total voltage applied
  - Ratio of the sum of voltages across both inductor and capacitor to the total voltage applied
11. If two coils with self inductance  $L_1$  and  $L_2$  are inductively coupled with mutual inductance of  $M$ , the coefficient of Coupling can be expressed as –
- $(L_1 * L_2) / M^2$
  - $(M) / \sqrt{(L_1 * L_2)}$
  - $\sqrt{(M)} / (L_1 * L_2)$
  - $(L_1 * L_2)^2 / (M)^2$
12. In the following series circuit when  $t$  indicates time and  $V_{in}$  indicates a DC voltage, current flowing through the resistor may be expressed as –



- $(V/R) * (e^{-t/RC})$
  - $(V * R) * (e^{-t/RC})$
  - $(V/R) * (e^{t/RC})$
  - $(V * R) * (e^{t/-RC})$
13. Laplace transform –
- Changes frequency domain function to time domain
  - Changes time domain function to frequency domain
  - Changes both time domain function to frequency domain and vice-versa
  - Conditionally changes frequency domain function to time domain
14. If Laplace transform is defined as below with symbols carrying their standard meaning–

$$F(s) = \int_0^{\infty} f(t)e^{-st} dt.$$

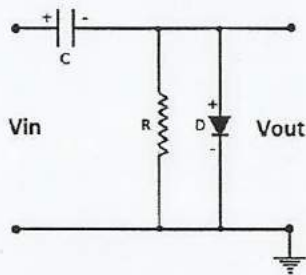
And  $u(t) = 1$  for  $t \geq 0$  and  $u(t) = 0$  for  $t < 0$ , the Laplace transform of  $[u(t) - u(t - a)]$  where  $a$  is a constant can be expressed as –

- $(1/S) * (1 - e^{-as})$
  - $(1/S) * (1 + e^{-as})$
  - $(1 + S) * (1 - e^{-as})$
  - $(1 - S) * (1 - e^{-as})$
15. Laplace transform can be used -
- to find transient current in circuits only with energy storing elements
  - to find transient current in circuits only without energy storing elements
  - to find transient current in circuits both with or without energy storing elements
  - in none of the above cases

16. For a two port network, transfer impedances of one port with respect to the other port open are represented as  $Z_{12}$  and  $Z_{21}$ , If it is found that  $Z_{12} = Z_{21}$ , which among the following statement is true –
- The two port network is Reciprocal not Bilateral
  - The two port network is Bi-lateral not Reciprocal
  - The two port network is both reciprocal and Bilateral
  - Neither Bilateral nor Reciprocal
17. For a two port network hybrid parameters (h) are defined as follows  
 $V_1 = h_{11} i_1 + h_{12} V_2$   
 $i_2 = h_{21} i_1 + h_{22} V_2$
- Short circuit input impedance  $h_{11}$  can be measured if  $V_2$  is 0
  - Short circuit input impedance  $h_{11}$  can be measured if  $V_2$  is positively infinite
  - Short circuit input impedance  $h_{11}$  can be measured if  $V_2$  is negatively infinite
  - Short circuit input impedance  $h_{11}$  can be measured if  $V_2$  is anything except 0
18. A diaphragm has a natural frequency of 30 KHz. If both its diameter and thickness are halved, the natural frequency will be
- 15 kHz
  - 60 kHz
  - 120 kHz
  - 240 kHz
19. Which among the following semiconductor devices can be used to measure magnetic field strength
- Photo Diode
  - Photovoltaic cell
  - Hall effect transducer
  - IMPATT diode
20. It is found that the ratio of root mean square value of alternating component to the DC component of load current drawn out of a DC power supply is almost zero. Hence the power supply can be –
- Faulty
  - A power supply with considerable filtration
  - A power supply with no filtration
  - A power supply with High output impedance
21. If  $V_{NL}$  is no load voltage and  $V_{RL}$  are the no load voltage and rated load voltage of a power supply, then percentage regulation can be expressed as –
- $((V_{NL} + V_{RL}) / V_{RL}) \times 100\%$
  - $((V_{NL} + V_{RL}) / V_{NL}) \times 100\%$
  - $(V_{NL} / V_{RL}) \times 100\%$
  - $((V_{NL} - V_{RL}) / V_{RL}) \times 100\%$
22. Zener Diodes are used with series resistors to avoid –
- Reverse biasing of the diode
  - Fast switching of the diode
  - Thermal Runaway
  - Instability of biasing



23. The following circuit is an example of –



- Positive clamper
- Negative clamper
- Both positive and negative clamper
- Clipper

24. A bipolar junction transistor is a

- Current driven device
- Voltage driven device
- Both current and voltage driven device
- Neither current nor voltage driven device

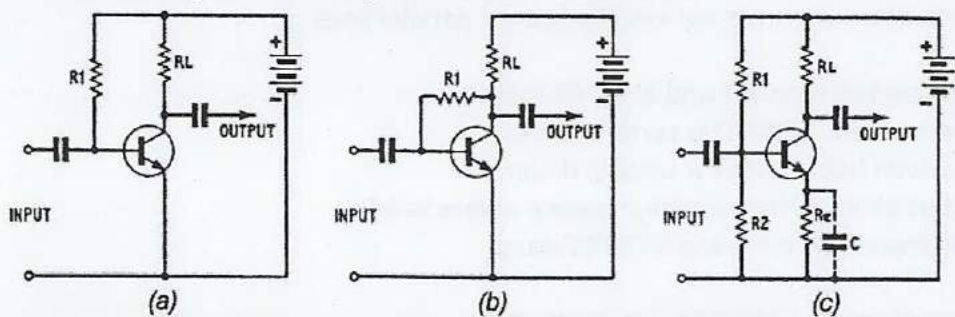
25. If  $\alpha$  is the DC current gain for common base configuration and  $\beta$  is the forward DC current gain in common emitter configuration then  $\alpha$  and  $\beta$  are related as –

- $\beta = \alpha / (1 - \alpha)$
- $\beta = \alpha / (1 + \alpha)$
- $\beta = (1 - \alpha) / (1 + \alpha)$
- $\beta = (1 - \alpha) / \alpha$

26. Thermal runaway is caused in transistors because of –

- Low current gain
- rapid fall of reverse saturation current
- rapid increase in reverse saturation current
- operation in cutoff region

27. which among the following has best bias stabilization –



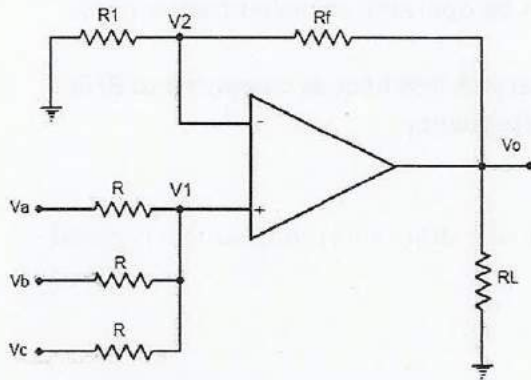
- Circuit (a)
- Circuit (b)
- Circuit (c)
- Both circuit (a) and (b)

28. Which among the following can be used for Bias compensation of Transistors –
- A Diode of the same material of the transistor or a thermistor
  - A Tunnel diode
  - An Inductor
  - A Capacitor
29. Shot noise is created in transistors due to –
- Operation at a very low frequency
  - Operation at lower supply voltage
  - Operation without bias stabilization
  - Operation at very high frequency
30. For an emitter follower circuit the voltage gain is –
- Very High almost infinite
  - Very low almost Zero
  - Unity
  - Hard to define
31. Input impedance is highest for –
- Common Emitter configuration
  - Common Base configuration
  - Common Collector configuration
  - Both for (a) and (b)
32. In a darlington pair arrangement of transistors, if two transistors are having gains of  $\beta_1$  and  $\beta_2$ -
- Resultant gain will be  $\beta_1 + \beta_2$
  - Resultant gain will be  $\beta_1 * \beta_2$
  - Resultant gain will be  $\beta_1 - \beta_2$
  - Resultant gain will be  $\beta_1 / \beta_2$
33. Distortions created at the output of transistor amplifiers is because –
- Input impedance of the transistors are negligible
  - Output current does not change with input current
  - Output impedance is very low
  - Output characteristic curves are not equally-spaced parallel lines
34. The basic difference between BJT and MOSFET is that –
- BJT is voltage driven but MOSFET is current driven
  - BJT is current driven but MOSFET is voltage driven
  - BJT has linear but MOSFET has nonlinear output characteristic
  - BJT doesn't generate high noise but MOSFET does
35. The current flows through a MOSFET is comprised of –
- Only one type of carrier either electrons or holes
  - Both electrons and holes
  - Neither electrons nor holes
  - Mostly holes and partially electrons



36. For which among the following reasons FETs can be operated at higher frequencies-
- Drift is faster than diffusion
  - High speed switching performance of FETs generates less heat as compared to BJTs
  - Bias stabilization doesn't get disturbed at high frequency
  - All the above points
37. Ratio of Drain to source voltage to drain current with drain shorted to source is called –
- Mutual Conductance
  - Trans conductance
  - Common source forward trans admittance
  - All the above
38. Channel Length modulation of MOSFETs is caused by –
- Large gate voltage
  - Large Drain Voltage
  - Widening of inverted channel
  - None of the above
39. A TRIAC can be represented by
- Parallel combination of two SCRs
  - Series combination of two SCRs
  - Anti parallel combination of two SCRs
  - A single SCR
40. In a controlled rectifier which among the following techniques are used –
- Firing angle is controlled to regulate period of conduction
  - Forward bias is controlled to regulate period of conduction
  - Both (a) and (b)
  - Neither (a) nor (b)
41. DIAC can be represented by –
- Two diodes in series
  - Two diodes connected back to back
  - Two diodes in anti-parallel
  - Two diodes in parallel
42. For high impedance isolation between a low voltage controller and a high voltage controlled circuit which among the following is best suited –
- DIAC connected to the gate of a TRIAC
  - An SCR with resistive triggering arrangement of gate
  - A crowbar circuit
  - An optical isolator

43. For the circuit below the output voltage  $V_0$  will be –



Summing amplifier non inverting configuration

- $(1 + (R_f / R_1)) * ((V_a + V_b + V_c) / 3)$
- $(1 - (R_f / R_1)) * ((V_a + V_b + V_c) / 3)$
- $(1 + (R_f / R_1)) * (V_a + V_b + V_c)$
- $(1 + (R_f / R_1)) * ((V_a + V_b + V_c) / 3R)$

44. For an operational amplifier common mode gain is very low and differential gain is infinite

- The op-amp will have unity CMRR and may be called Ideal
- The op-amp will have 0 CMRR and cannot be called ideal
- The op-amp will have infinite CMRR and may be called ideal
- The op-amp will have infinite CMRR and may not be called ideal

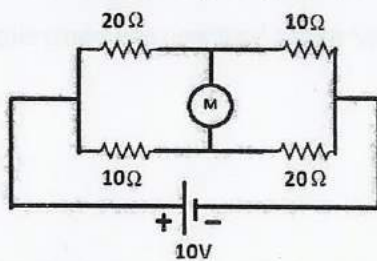
45. The equation  $\Delta \cdot J=0$  is known as

- Poisson's equation
- Laplace equation
- Continuity equation
- Maxwell equation

46. Digital modulation techniques are used in satellite communication system since

- They are easier to handle
- Large bandwidth utilization is possible
- They have a spectral efficiency
- They are less prone to interference

47. Reading of high impedance voltmeter M in the bridge circuit shown in the figure is –

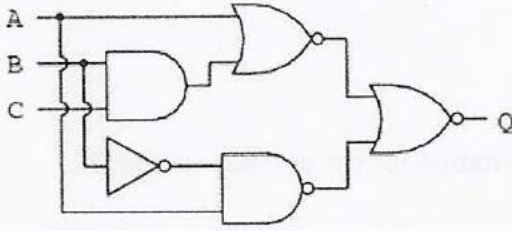


- 0 V
- 3.33 V
- 4.20 V
- 6.66 V



48. Band gap of a material used in a photo detector and the energy of the incident photon is related as
- $E_g \geq (hc/\lambda)$
  - $(hv^2/\lambda) \geq E_g$
  - $hv \geq E_g$
  - $(1/2)hv \leq E_g$
49. The binary, octal, hexadecimal and radix 5, representation for the decimal number 32
- $(10000)_2, (40)_8, (20)_{16}, (112)_5$
  - $(10010)_2, (45)_8, (20)_{16}, (112)_5$
  - $(10000)_2, (40)_8, (20)_{16}, (120)_5$
  - $(10000)_2, (40)_8, (20)_{16}, (111)_5$
50. Which one of the following transducers is the most suitable for the measurement of linear displacement
- Strain gauge
  - LVDT
  - Piezoelectric crystal
  - Microphone
51. Disadvantage of wide band Frequency modulation is –
- It needs high power amplifiers
  - It is prone get affected by noise
  - The carrier frequency drifts
  - It needs more bandwidth
52. Adaptive delta modulation is an up-gradation of Delta modulation because –
- It needs wider bandwidth
  - It needs low power for transmission
  - It needs complex circuits for generation
  - It does not suffer slope overload error
53. Inter-symbol interference can be avoided by –
- Sampling a signal far below Nyquist rate
  - Mixing signals without guard period
  - Separating symbols with guard period and sampling at Nyquist rate
  - Mixing signals without guard period and sampling at Nyquist rate
54. An XNOR gate can be designed using –
- At-least 6 NAND gates
  - At-least 5 NAND gates
  - At-least 4 NAND gates
  - At-least 2 NAND gates
55. A 4 bit parallel adder is made with 4 TTL full adder modules. For faithful operation, Carry input of the most significant module –
- Can be left open
  - Can be pulled up
  - Can be grounded
  - Anything among the above three can be opted

56. Simplified form of the following circuit will be –



- a.  $A'B$
- b.  $A' + B'$
- c.  $AB'$
- d.  $A'B'$

57. A decoder has –

- a. 1 Data input and  $2^n$  outputs
- b. Multiple data inputs and 1 data output
- c. 1 data inputs and  $(n - 1)$  data outputs
- d. n data inputs and  $2^n$  data outputs

58. Sum of Products form of the following equation will be–

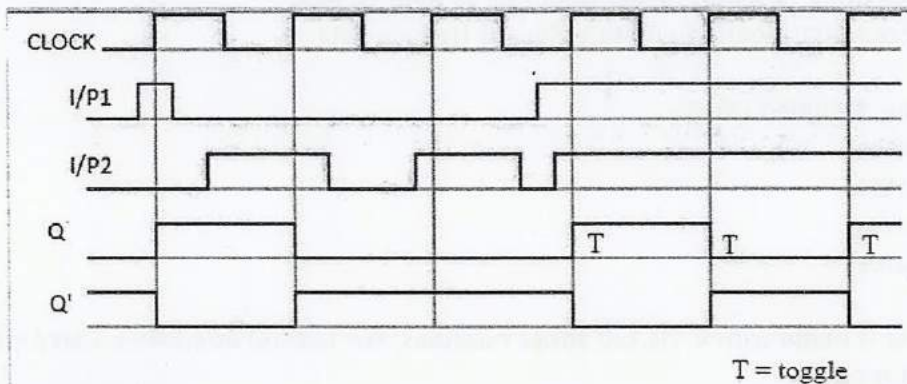
$$(ac + b)(a + b'c) + ac$$

- a.  $ac + ab' + bc$
- b.  $ac + ab'c + ab$
- c.  $ab' + b$
- d.  $ab' + bc$

59. Glitches form in Asynchronous counters because–

- a. It needs more complex circuitry
- b. The speed of operation is lower
- c. Output changes state immediately the inputs change state
- d. Accumulation of delay in changing the output state according to input

60. Following timing diagram indicates which Flip flop –



- a. SR Flip Flop
- b. SR Latch
- c. JK Flip Flop
- d. JK Master Slave Flip Flop



61. Cascading counters results in –
- Higher Modulus operation
  - Lower Modulus operation
  - Unchanged Modulus operation of elementary counters
  - None of the above
62. In which among the following circuits counters can be used in–
- Analog to Digital Converters
  - Frequency Meters / Counters
  - Microprocessors
  - All the above
63. Which among the following Analog to Digital converters use integrator circuit –
- Flash ADC
  - Successive Approximation type ADC
  - Dual Slope ADC
  - Sigma Delta ADC
64. If Sampling rate of a baseband signal prior to digitization is increased –
- The bandwidth requirement will decrease but Signal to noise ratio will increase
  - Both the bandwidth requirement and Signal to Noise ratio will increase
  - Both the bandwidth requirement and Signal to Noise ratio will decrease
  - Bandwidth requirement will increase but Signal to noise ratio will decrease
65. Flash memory units can retain data even after power off because –
- It has a floating gate to retain charge
  - The channel width is more in such memories
  - It does not suffer from thermal runaway
  - It does not have control gate
66. If a processor is said to be a floating point processor that means –
- It cannot store natural numbers in the form of mantissa and exponent
  - It can store numbers with a fixed number of digits after decimal point
  - It can only store natural numbers but cannot process them
  - It can store numbers whose decimal point can change position relative to significant digits
67. Most of the cellular phone chargers used to have a sleek and light weight design because –
- The transformer they use are smaller as they are operated at a very low frequency
  - The transformer they use are smaller as they are operated at a higher frequency
  - The transformer they use are smaller as they are operated at line frequency
  - None of the above
68. The term DIMM with reference to RAM slots of a mother board stands for –
- Dual in line Master Memory
  - Dual in line Major Memory
  - Dual in line Memory Module
  - Dual in line Memory Manager

69. An IP address in a computer network can help –

- a. In identifying a device logged into a network
- b. In communicating with other devices
- c. In identifying a probable physical location of the device logged into a network
- d. All the above

70. IP address length for an IPv6 compliant system would be–

- a. 128 bit
- b. 64 bit
- c. 32 bit
- d. 16 bit

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