

**Paper: BEL Placement Paper (Technical- Electronics VI)**

1. The professional printed circuit board generally use the following as the raw material:
  - a. Paper base bakelite copper clad sheet
  - b. Glass epoxy copper clad sheet
  - c. Tin plated Nylon sheet
  - d. Silver plated pyrex sheet
2. Many switch contacts use silver as the material because
  - a. It is a good electrical conductor with low contact resistance
  - b. Silver does not tarnish
  - c. It is easily shaped as per requirement
  - d. It is very hard and does not wear off
3. A resistance of approximate value  $85\Omega$  is to be measured by using an ammeter of range 0-1 A having a resistance of  $20\Omega$  and voltmeter of range 0-50V having a resistance of  $5000\Omega$ . Two arrangement for the measurement are shown in the figure below. Which

method would you recommend?

- a. Method X
  - b. Method Y
  - c. Either X or Y
  - d. Neither X nor Y
4. The value of capacitance across points A & B in the circuit shown below is (in microfarads)

a. 3      b. 1      c. 0.67      d. 0.33

5. It is proposed to fabricate a simple Ohm meter for measuring resistor values. A milliammeter with an internal resistance of  $50\Omega$  is available. Choosing a configuration using a 3 V battery, a large resistance and the ammeter in a loop, the unknown resistor is proposed to be measured by noting the current initially and then connecting the unknown resistor across the ammeter. If the ratio of the two current is 2, what is the value of the unknown resistor ( $R\Omega$ ) ?
  - a. 3000      b. 150      c. 100      d. 50

6. The current  $I$  flowing into the branch indicated by an arrow in the circuit shown is equal to

- a. 2 Amp      b. 0.5 Amp      c. 1 Amp      d. 0.25 Amp

7. For the circuit shown, the maximum power is delivered to the load resistance  $R_L$  when the value of  $R_g$  is

- a. 2 ohms      b. zero      c. 10 ohms      d. infinity

8. A signal generator is available in the laboratory, which is in good condition except for the attenuator dial which has got displaced. In order to calibrate this, a high frequency oscilloscope is available. At a particular setting of the knob an open circuit voltage of 450 mV rms is measured. If the impedance of the generator is 50 ohms, the setting of the attenuator dial is to be adjusted for

- a. 6 dBm      b. 1 dBm      c. 0 dBm      d. 10 dBm

9. The relation  $\text{Log}_e (X + \text{Log}_e (1 + X)) = 0$  also means that

- a.  $X^2 + X + 1 = 0$   
b.  $X^2 + X - 1 = 0$   
c.  $X^2 + X + e = 0$   
d.  $X^2 + X \hat{=} e^{-1}$

10. The Laplace transform of the function  $f(t) = \cos wt$  is

- a.  $w/(s^2 + w^2)$   
b.  $s^2/(s^2 - w^2)$   
c.  $w^2/(s^2 + w^2)$   
d.  $s/(s^2 + w^2)$

11. If  $a = b = c$ , one value of  $X$  which satisfies the equation

$=0$  is given by

- a.  $x=a$       b.  $x=b$       c.  $x=c$       d.  $x=0$

12. An LC oscillator is being analysed. If the LC tank circuit (with quality factor =  $Q$ ) is isolated from the amplifying device, the impedance at the resonant frequency as measured looking into the amplifier will be

- a.  $Q r [LC]^{1/2}$
  - b.  $\frac{1}{2} r p r [LC]^{1/2}$
  - c.  $\frac{1}{2} Q r [LC]^{1/2}$
  - d.  $Q r [LC]^{1/2}$
13. A battery eliminator is required to be constructed and an assortment of rectifiers, resistors and capacitors is available. However, the step down transformer available has no center tap. The following configurations for the rectifier are feasible. The one giving the lowest ripple will be
- a. Full wave rectifier
  - b. Half wave rectified
  - c. Bridge rectifier
  - d. None
14. Chokes used in rectifier filter circuits are wound on a core with a small air gap. This is done in order to
- a. Get as high an inductance as possible
  - b. Prevent saturation of the core
  - c. Absorb the ripple effectively
  - d. Prevent loading the transformer
15. An integrated circuit linear regulator is used at the output of a power supply having a ripple of 1 V rms. Assuming that the IC represents a typical design generally available, the output rms ripple to be expected will be
- a. 0.1 V rms    b. 0.1 mV    c. 100 mV    d. 10 V rms
16. The minimum PIV rating for the diode in the rectifier circuit shown should be
- a. 36v    b. 18v    c. 26v    d. 52v
17. For VHF interfering waves generated by automobile ignition systems or other electrical equipment located close to the ground, specify which of the following components of the interfering signal are significant at receiving locations such as used in the reception of TV signals:
- a. Horizontal polarization component
  - b. Vertical polarization component
  - c. Both horizontal and vertical polarization components
  - d. Neither horizontal nor vertical polarization components
18. The ratio of lower frequency limit to the MUF for radio communication at short-wave is generally
- a. Smaller at night than in the day time
  - b. Larger at night than in the day time
  - c. Same at night and in the day time
  - d. A maximum during the evening times
19. Two UHF amateur radio antenna placed at the same height and 30 statute miles apart are to be such that each is on the radio horizon line of the other. The height of the antennas should be

- a. 56.25 ft      b. 112.5ft      c. 150ft      d. 225ft
20. A transmitter with a radiated power of 1 KW produces a field strength of 300 mV/m at a distance of 1 Km from the antenna. If the transmitter power is increased to 50 KW and the vertical directivity of the antenna is increased by a factor of 1.41, the field strength at the same distance from the antenna is approximately
- a. 1.5 V/m      b. 2.115 V/m      c. 3.0 V/m      d. 6.0 V/m
21. The directive gains of non-resonant and resonant wire antennas of equal length are approximately in the ratio of
- a. 4:1      b. 1.5:1      c. 1:1      d. 3:1
22. A simple wire radiator produces a radiation field of intensity 100 mV/m at a distance point 25 Km away. The field produced (in mV/m) at a point 50 Km away in the same direction is
- a. 25      b. 50      c. 12.5      d. 100
23. Assuming the plane of polarization of the incoming wave and the plane of the receiving antenna to be the same, the effective height of the receiving antenna is proportional to
- a. Radiation resistance  
b. Power gain of the antenna  
c. Physical area of the antenna  
d. Wavelength, assuming other parameters being same
24. The function performed by the following circuits is
- a. General combinational logic  
b. Exclusive OR logic  
c. Exclusive NOR logic  
d. Digital comparator logic
25. Narrow trigger pulses are required to be generated from a square wave pulse train (pulse width = T). The linear wave shaping circuit would be an RC circuit (time constant = T) with the following features:
- a. High pass with  $T \ll T$   
b. High pass with  $T \gg T$   
c. Low pass with  $T \gg T$   
d. Low pass with  $T \ll T$
26. The circuit given below acts as
- a. An OR gate  
b. An AND gate  
c. An inverter

d. A NOR gate

27. In the circuit shown below. if  $R = 0$  and  $S = 1$ , the outputs  $Q$  and  $Q'$  will be

- a.  $Q$  low,  $Q'$  high
- b. Both low
- c.  $Q$  high,  $Q'$  low
- d. Both high

28. Schmitt trigger buffers are normally used as input buffers to digital logic circuit to achieve

- a. Higher isolation
- b. Higher fan-in-capability
- c. Higher drive capability
- d. Higher noise-immunity

29. For a reverse-biased PN junction. If the applied voltage is doubled the junction capacitance decreases by a factor of  $2^{1/2}$ . Assuming the junction acts as a parallel plate condenser, the average spacing between the plates changes by a factor of

- a.  $2^2$
- b. 2
- c.  $1/2^{1/2}$
- d.  $2^{1/2}$

30. Many frequency sources use a piezo-electric resonator in the feedback circuit essentially to achieve a

- a. Miniature product
- b. Low cost design
- c. Stable frequency
- d. Large output power

31. A pulse train has the following characteristics:

Peak amplitude = 10 V, Pulse ON time 1 sec

Pulse OFF time = 4 sec

The pulse train is passed through a high pass RC filter with a large timeconstant. The amplitude of the positive peak at the output will be

- a. 10 V
- b. 2V
- c. 4V
- d. 8V

32. The results for open circuit test on a single phase transformer are as follows:

Applied voltage = 100 V, Current drawn = 0.5 Amp

Power consumed = 30 W

The magnetizing reactance of the transformer is

- a. 250 ohms      b. 200 ohms      c. 400 ohms      d. 500 ohms
33. The principle of velocity modulation is NOT used in the following microwave device:
- Traveling wave tube
  - Magnetron
  - Klystron
  - Reflex klystron
34. The "Pulling Figure" of a magnetron is due to
- Variation in the output load
  - Variation in the input load
  - Variation in both input and output loads
  - None
35. The depletion layer in a P-N junction
- Contains only immobile charges
  - Contains only mobile charge carriers
  - Is depleted of all charge carriers
  - Contains both mobile and immobile charge carriers
36. Consider two bars of a semiconductor of identical dimensions one of which doped P-type and the N-type, with equal number of impurity atoms, the resistance of the P-type bar is
- Equal to that of the N-type bar
  - Greater than that of the N-type bar
  - Lesser than that of the N-type bar
  - Not related to that of the N-type bar
37. If the base width of a bipolar transistor is increased, then its current gain
- Increases
  - Decreases first and then increases
  - Remains constant
  - Decreases
38. In a FET, the drain current beyond the pinch off point
- Increases rapidly with increase in drain to source voltage
  - Reduces slowly with increase in drain to source voltage
  - Remains almost constant
  - Is zero
39. The key feature of CMOS inverter from the point of low power dissipation is that
- one of the devices is cut-off in either logic state
  - it uses one each of MOS and NMOS devices
  - silicon area required is low
  - its high speed capability
40. At an ambient temperature of 25° C, the junction temperature of a transistor has reached 150° C while dissipation 100 Watts of power. The junction ambient thermal resistance of the transistor is
- 1.25° /W
  - 0.8° /W
  - 1.5° /W
  - 2.5° /W
41. For a transmission line with air dielectric, the attenuation constant at extremely high frequencies is
- Directly proportional to the frequency
  - Inversely proportional to the frequency
  - Directly proportional to the square root of frequency

- d. Inversely proportional to the square root of frequency
42. In a transmission line with characteristic impedance 50  $\Omega$  a resistive load of 25  $\Omega$  produces a VSWR of 2. The same VSWR will be produced if the resistive load is changed to
- 75  $\Omega$
  - 100  $\Omega$
  - 125  $\Omega$
  - 250  $\Omega$
43. A load resistance of 300  $\Omega$  is to be matched to a two wire transmission line of characteristic impedance 600  $\Omega$  using a quarter-wave line. The characteristic impedance of the matching line should be
- 424  $\Omega$
  - 300  $\Omega$
  - 450  $\Omega$
  - 900  $\Omega$
44. An oscilloscope video amplifier is found to use a transistor in the common base configuration. The reason for this would be
- It has a very good high frequency response
  - It gives a higher input impedance
  - It is a very stable configuration
  - It consumes very low current
45. RF amplifiers are generally configured as class C tuned stages. The conduction angle is kept as low as possible consistent with output power because
- It improves distortion
  - It reduces oscillatory tendency
  - It increases RF gain
  - It improves efficiency
46. In a directional coupler having 30 dB coupling the RF power available at the coupled output is 10 mW. The power input to the directional coupler is
- 100 mW
  - 1 W
  - 10 W
  - 100 W
47. It is required to design a small instrumentation amplifier to improve the sensitivity of an available instrument. For stabilizing the gain under the operating conditions, negative voltage feedback of 10% is considered adequate. If the closed loop gain is required to be 5 (five), the open loop gain required for the amplifier will be
- 0.5
  - 10
  - 5.5
  - 50
48. A video amplifier is required to be designed for amplifying signals from a TV camera. The back to white transition can take place within 70 nanosec from 10% to 90% of the amplitude of the picture signal. The maximum bandwidth to be chosen for the video amplifier will be
- 70 MHz
  - 7 KHz
  - 7 MHz
  - 5 MHz
49. A microphone amplifier is available which is required to be used with a new microphone of higher sensitivity. With a supply voltage of 12V one of the class A stage is found to be clipping at 6V peak voltage. By changing the collector load to a transformer coupled design instead of resistive, clipping would occur at
- 3V
  - same level as before
  - 12V
  - 24V
50. In order to get higher power output, two audio amplifiers working in class A are proposed to be combined. There is also an alternate way to convert both stages to class B and then combine. If this alternative is adopted, the maximum audio power can be greater than the class A case by a factor of approximately
- 12
  - 2
  - 4
  - 6
51. Cross-over distortion in audio amplifier is generally present in
- Class B amplifiers
  - Class A amplifiers
  - Class A amplifier with negative feedback
  - Transformer coupled class A amplifiers
52. Negative feedback is applied to audio amplifiers to obtain stable gain. As result the distortion will

- a. Be unaltered
  - b. Increase
  - c. Decrease
  - d. Disappear
53. Many instrument preamplifiers are transistor gain stages coupled directly without capacitors. This is done in order to obtain
- a. A good low frequency response
  - b. A good impedance match
  - c. A high gain
  - d. A low noise output
54. Class B push-pull operation gives an output signal with low distortion because
- a. It operates in linear portion of V-I characteristic
  - b. Even harmonic components get cancelled
  - c. There is inherent feedback to reduce distortion
  - d. Distortion components are automatically filtered out
55. Cross modulation in a receiver takes place in the
- a. Audio amplifier stage
  - b. IF amplifier stage
  - c. RF amplifier stage
  - d. Detector stage
56. Neutralizing circuits are used in tuned RF amplifiers to
- a. Improve efficiency
  - b. Develop more RF power
  - c. Prevent oscillations due to internal feedback
  - d. Obtain good thermal stability
57. It is required to construct a simple oscillator to test transducers in the audio frequency range. It is proposed to configure a Wein bridge circuit for which required resistor and capacitors are available. An amplifier is required to be produced to complete the design. The voltage gain to be specified for the amplifier is
- a. +1      b. -3      c. +3      d. +10
58. Amplitude modulation is essentially a process which translates the frequency spectrum. To achieve this
- a. Time varying linear systems, e.g. switching or chopping circuits only can be employed
  - b. Circuits using non-linear elements only can be used
  - c. Neither time varying linear nor non-linear circuit are required
  - d. Either time varying or non-linear circuits can be used
59. An envelope detector uses a parallel RC circuit to recover the message signal  $m(t)$  from an AM wave. If  $f_m$  is the maximum modulating frequency and  $f_r$  the cut-off frequency of the RC circuit, the relationship between  $f_m$  and  $f_r$  is
- a.  $f_r = f_m$
  - b.  $f_r > f_m$
  - c.  $f_r$  lies between  $f_m$  and  $f_c$  where  $f_c$  is the carrier frequency
  - d.  $f_r < f_m$
60. The bandwidth (in MHz) of a receiver to receive a QPSK modulated RF signal at a data rate of 1.5 MBps is
- a. 2.5      b. 0.75      c. 3.0      d. 6.0
61. Coherent radars utilize for the transmitter oscillator a
- a. Magnetron



- b. Master oscillator and TWT amplifier
  - c. Klystron
  - d. Reflex klystron
62. Interlace technique is used in TV for
- a. Improving horizontal resolution
  - b. Flicker reduction
  - c. Bandwidth reduction
  - d. Improving vertical resolution
63. Night effect is caused by
- a. Horizontally polarized waves traveling parallel to the ground
  - b. Vertically polarized waves traveling parallel to the ground
  - c. Vertically polarized down coming waves
  - d. Horizontally polarized down coming waves
64. VOR provides bearings with respect to
- a. Magnetic north
  - b. Heading of the aircraft
  - c. True north
  - d. Line joining the VOR and the aircraft
65. In VHF FM communication system, a high value of IF (viz. 10.7 MHz) is often used for obtaining
- a. Better image rejection
  - b. Better IF gain
  - c. Better adjacent channel rejection
  - d. Better sensitivity
66. An SSB system and a fully-modulated DSB system have the same peak power. The signal-to-noise power ratio of the SSB system is greater than the DSB system by a factor of
- a. 2
  - b. 4
  - c. 10
  - d. 8
67. In PCM system, for random type of noise at the receiver input, the error performance exhibits a saturation effect with increasing S/N ratio. This threshold is approximately at
- a. 26 dB
  - b. 14 dB
  - c. 17 dB
  - d. 20 dB
68. In an FM system, for a given transmitter power, the maximum range at which a usable signal can be received will be
- a. Greater for a narrower bandwidth
  - b. Greater for a larger bandwidth
  - c. Independent of bandwidth
  - d. Dependent on actual noise level
69. The IF amplification per stage in an FM receiver as compared to an AM receiver using the same amplifier devices is
- a. Smaller
  - b. Larger
  - c. Same
  - d. Dependent on the value of the IF
70. A random experiment has 16 equally likely outcomes. The information associated with each outcome is
- a. 16 bits
  - b. 1 bit
  - c. 2 bits
  - d. 4 bits
71. The minimum bandwidth required to receive an FM modulated signal with a modulating frequency between 0.5 MHz and 5.0 MHz and with a maximum deviation of 10 MHz is
- a. 20 MHz
  - b. 10.5 MHz
  - c. 30 MHz
  - d. 15.5 MHz

72. The total power in the two sidebands in a 100% modulated AM wave is
- Half the total in the modulated wave
  - One fourth the total in the modulated wave
  - One third the total in the modulated wave
  - Independent of the carrier power
73. For a two-tone modulating signal, the PEP of an AM transmitter is
- $P_{avg}$
  - $P_{avg} / 2$
  - $2P_{avg}$
  - $4P_{avg}$
74. The image frequency (in MHz) of a receiver with an IF of 21.4 MHz and RF input frequency of 434 MHz is
- 455.4
  - 476.8
  - 414.6
  - 42.8
75. The noise figure of a receiver having a front end low noise amplifier of noise figure 3 dB followed by a mixer of noise figure 20 dB is
- 4.1 dB
  - 22 dB
  - 3.2 dB
  - 2.0 dB
76. Demodulation of a single-side band signal is done using
- Ratio detector
  - Product detector
  - Envelope detector
  - Foster Seely circuit
77. In AM transmitters, such as used for police radios, for maintaining relatively high average percentage modulation irrespective of the speaker it is necessary to use
- AGC
  - Peak limiters
  - Volume compressors
  - AVC
78. In communication transmitters, use of saturated class C amplifiers after modulation
- Removes incidental FM in AM systems
  - Is not desirable in FM systems
  - Is permissible in AM systems
  - Removes incidental AM in FM systems
79. Pre-emphasis is used to
- To get better noise suppression at the low modulation frequencies
  - Maintain a constant modulation index for all modulating signals
  - Avoid signal being suppressed by large values of noise voltages
  - To improve S/N ratio at higher modulation frequencies
80. The selectivity of a Receiver is determined largely by the characteristics of the
- AF stage
  - Mixer stage
  - RF stage
  - IF stage
81. In a channel disturbed by white Gaussian noise, the channel capacity  $C$  in bits per second is given by  $C = B \log_2 (1 + S / N)$  where  $B$  is the channel bandwidth  $S$  is the signal power and  $N$  is the noise power. If the channel bandwidth is made infinite, the channel capacity will
- Remain constant
  - Become infinite
  - Reduce
  - Remain finite
82. The ON time in the drive voltage waveform for the horizontal deflection circuitry in a broadcast TV receiver is 16 microseconds. The duty ratio of this drive voltage is

- a. 40%      b. 25%      c. 20%      d. 75%
83. In the TV system adopted in India, the vision IF is  
a. 44.4MHz      b. 38.9MHz      c. 33.4MHz      d. 27.9MHz
84. In a TV system, diplexer is used for  
a. Using the same antenna for transmission and reception  
b. Combining the visual and aural signals into the same antenna  
c. Protecting the receiver from the high transmitter power  
d. Transmitting two programmes from the same transmitter
85. The amplitude of the sync pulse in a composite television signal with respect to blanking level is  
a. 0.3V      b. 1V      c. -0.3V      d. 4V
86. The modulator stage in a high power broadcast transmitter uses the following type of amplification  
a. Class B  
b. Class A  
c. Class AB  
d. Class C
87. The brightness control in a conventional TV receiver controls  
a. Video amplitude  
b. Grid voltage of the CRT  
c. Frequency of the horizontal oscillator  
d. Anode voltage of the CRT
88. The charge coupled device is used in television for  
a. Camera  
b. Receiver  
c. Transmitter  
d. Networking
89. Some MTI radars distinguish between moving and stationary targets using the principle that return pulses from  
a. Stationary targets contain Doppler shift  
b. Stationary targets are stronger  
c. Moving targets fluctuate in phase  
d. Moving targets have constant phase
90. In a pulsed radar operating at a frequency  $f$  Hz, with an interpulse period of  $T$  seconds, the maximum unambiguous range is given by  
a.  $cT$       b.  $cT/2$       c.  $fT$       d.  $fT/2$
91. Angular error is extracted in a modern tracking radar using  
a. Cosecant square pattern of the antenna  
b. Monopulse technique  
c. Helical scan  
d. None
92. A radar display which maps the bearing and range on a polar display is called  
a. A-scope display  
b. PPI display  
c. B-scope display  
d. C-scope display
93. For a pulsed radar operating with a 1 microsec pulse width and prf of 1 KHz, the average power is 15 W. If the prf alone is changed to 2 KHz, the average power will be  
a. 7.5W      b. 15 W      c. 30W      d. 3.75W

94. Radar beacons are used for
- Ship navigation within horizon range
  - Ship and aircraft navigation
  - Aircraft navigation and homing of airborne cargo
  - Transmitting distress signals
95. A parabolic antenna converts the energy from the feed located at the focus into a
- Plane wave front without uniform phase
  - Spherical wave front
  - Curved wave front without uniform phase
  - Plane wave front of uniform phase
96. A backward wave oscillator belongs to the family of
- Traveling wave tubes
  - Cross field tubes
  - Power grid tubes
  - None
97. The gain of a radar antenna is proportional to
- Aperture area / Wavelength
  - Frequency / Aperture
  - Aperture area / Square of the wavelength
  - Square of the Aperture area / wavelength
98. In a rectangular waveguide of internal dimensions 12.5 mm x 25 mm, the cut off wavelength for the dominant mode will be
- 5 cm
  - 2.5cm
  - 1.25cm
  - 3.75cm
99. In a reflex klystron, electrons bunch around the electron entering the cavity when the RF electric field at the gap is
- Zero and changing from accelerating to accelerating phase
  - Zero and changing from accelerating to decelerating phase
  - Maximum and in the accelerating phase
  - Maximum and the decelerating or accelerating phase
100. The Doppler frequency shift is
- Dependent only on the radar frequency
  - Dependent on the target velocity
  - Dependent both on the relative radial velocity of the target and the radar frequency
  - Independent of the radar frequency.