ENTRANCE TEST-2019   000418

SCHOOL OF ENGINEERING

M.TECH. IN ELECTRONICS ENGINEERING

Total Questions : 60   Question Booklet Series **B**

Time Allowed   : 70 Minutes   Roll No:

Instructions for Candidates:

1. Write your Roll Number in the space provided at the top of this page of Question Booklet and fill up the necessary information in the spaces provided on the OMR Answer Sheet.

2. OMR Answer Sheet has an Original Copy and a Candidate's Copy glued beneath it at the top. While making entries in the Original Copy, candidate should ensure that the two copies are aligned properly so that the entries made in the Original Copy against each item are exactly copied in the Candidate's Copy.

3. All entries in the OMR Answer Sheet, including answers to questions, are to be recorded in the Original Copy only.

4. Choose the correct / most appropriate response for each question among the options A, B, C and D and darken the circle of the appropriate response completely. The incomplete darkened circle is not correct read by the OMR Scanner and no complaint to this effect shall be entertained.

5. Use only blue/black ball point pen to darken the circle of correct/most appropriate response. In no case gel/ink pen or pencil should be used.

6. Do not darken more than one circle of options for any question. A question with more than one darkened response shall be considered wrong.

7. There will be 'Negative Marking' for wrong answers. Each wrong answer will lead to the deduction of 0.25 marks from the total score of the candidate.

8. Only those candidates who would obtain positive score in Entrance Test Examination shall be eligible for admission.

9. Do not make any stray mark on the OMR sheet.

10. Calculators and mobiles shall not be permitted inside the examination hall.

11. Rough work, if any, should be done on the blank sheets provided with the question booklet.

12. OMR Answer sheet must be handled carefully and it should not be folded or mutilated in such case it will not be evaluated.

13. Ensure that your OMR Answer Sheet has been signed by the Invigilator and the candidate himself/herself.

14. At the end of the examination, hand over the OMR Answer Sheet to the invigilator who will first tear off the original OMR sheet in presence of the Candidate and hand over the Candidate's Copy to the candidate.

1. Patch is a
   a) High gain wide band antenna
   b) High gain narrow band antenna
   c) Low gain narrow band antenna
   d) Low gain wide band antenna

2. In the Op-Amp circuit shown, assume that the diode current follows the equation $I = I_s \exp(V/V_T)$. For $V_i = 2V$, $V_o = V_{o1}$ and for $V_i = 4V$, $V_o = V_{o2}$. The relationship between V_{o1} and V_{o2} is:
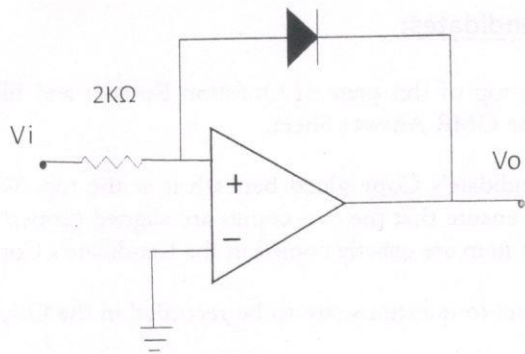
   a) $V_{o2} = \sqrt{2}V_{o1}$
   b) $V_{o2} = e^2 V_{o1}$
   c) $V_{o2} = V_{o1} \ln 2$
   d) $V_{o1} - V_{o2} = VT \ln 2$

3. An 8085-assembly language program is given below.

   MVI A, B5H
   MVI B, 0EH
   XRI 69H
   ADD B
   ANI 9BH
   CPI 9FH
   7: STA 3010H
   8: HLT

   The contents of the accumulator just after execution of the ADD instruction will be
   a) C3H
   b) EAH
   c) DCH
   d) 69H

4. The Boolean function $Y = AB + CD$ to be realized using only 2 input NAND gates. The minimum number of gates required is
   a) 2
   b) 3
   c) 4
   d) 5

5. For Hertzian dipole antenna, the half power beam width (HPBW) in the E-Plane is
   a) $360°$
   b) $180°$
   c) $90°$
   d) $45°$

6. The ability of a receiver to discriminate against the interfering signals is known as
   a) Selectivity
   b) Sensitivity
   c) Fidelity
   d) Distortion

7. In an electric circuit, 4 resistances each of 10 ohm are connected in parallel. What is the value of the equivalent conductance of the circuit?
   a) 40
   b) 0.4
   c) 10
   d) 0.1

8. The DC-current gain (β) of a BJT is 50. Assuming that the emitter injection efficiency is 0.995, the base transport factor is:
   a) 0.980
   b) 0.985
   c) 0.990
   d) 0.995

9. A Hilbert transform is a
   a) non-linear system
   b) non casual system
   c) time varying system
   d) low pass system

10. An LED made of GaAs operates at a wavelength of 0.86 um. The surrounding medium is air. The relative permittivity of GaAs is 12.9. The external quantum efficiency of the LED is
   a) 2.31%
   b) 23.1%
   c) 13.1%
   d) 1.31%

11. The drain current of a MOSFET in saturation is given by $I_D = K (V_{GS} - V_T)^2$ where K is a constant. The magnitude of the transconductance g_m is

a) $\dfrac{K(V_{GS} - V_T)^2}{V_{DS}}$

b) $2K (V_{GS} - V_T)$

c) $\dfrac{I_D}{V_{GS} - V_{DS}}$

d) $\dfrac{K(V_{GS} - V_T)^2}{V_{GS}}$

12. A uniform plane wave in the free space is normally incident on an infinitely thick dielectric slab (dielectric constant $\varepsilon_r = 9$). The magnitude of the reflection coefficient is

a) 0

b) 0.3

c) 0.5

d) 0.8

13. A rectangular waveguide of internal dimensions (a = 4 cm and b = 3 cm) is to be operated in TE_{11} mode. The minimum operating frequency is

a) 6.25 GHz

b) 6.0 GHz

c) 5.0 GHz

d) 3.75 GHz

14. The amplitude of a random signal is uniformly distributed between -5 V and 5 V. If the Signal to Quantization noise ratio required in uniformly quantizing the signal is 43.5 dB, the step size of the quantization is approximately

a) 0.0333 V

b) 0.05 V

c) 0.0667 V

d) 0.10 V

15. The full form of the abbreviations TTL and CMOS in reference to logic families is

a) Triple Transistor Logic and Chip Metal Oxide Semiconductor

b) Tristate Transistor Logic and Chip Metal Oxide Semiconductor

c) Transistor Transistor Logic and Complementary Metal Oxide Semiconductor

d) Tristate Transistor Logic and Complementary Metal Oxide Semiconductor

16. The unit step response of a system starting from rest is given by
$$c(t) = 1 - e^{-2t} \text{ for } t \geq 0$$
The transfer function of the system is:

a) $\dfrac{1}{1+2s}$

b) $\dfrac{2}{2+s}$

c) $\dfrac{-}{2+s}$

d) $\dfrac{2s}{1+2s}$

17. What is the percent of modulation of an AM wave whose total power is 3.3KW and each sideband contains 400W?

a) 80%

b) 97%

c) 50%

d) 66.6%

18. What is the resistance when the length and area of a cross section of a wire are doubled assuming the initial resistance of the wire is R ohms?

a) 2R

b) R

c) 4R

d) R/2

19. In digital electronics, Darlington pair or connection in two transistors is created by

a) Disconnecting both collectors

b) Connecting both collectors

c) Disconnecting both emitters

d) Connecting both emitters

20. Choose the incorrect statement with respect to SCR from the following

a) It is a bidirectional device

b) It has better power handling capacity than simple BJTs

c) It is triggered by a Gate signal

d) It can be used for high power or industrial applications

21. Which among the following is a new high conductance MOS gate-controlled power switch?
    a) BJT
    b) Diode
    c) IGBT
    d) SCR

22. Which slope is represented by $1/j\omega$ in transfer function in Bode diagram corresponding to log magnitude plot?
    a) - 50 dB/decade
    b) -2 dB/decade
    c) -20 dB/decade
    d) -5 dB/decade

23. A negative feedback closed loop system is supplied an input of 10V. The system has forward gain of 1. What is the output voltage? (Given $\beta = 1$)
    a) 5 V
    b) 10 V
    c) 2.5 V
    d) 20 V

24. What is the purpose of providing a fuse in an electric circuit?
    a) To safeguard the installation against heavy current
    b) To reduce the current flowing in the circuit
    c) To reduce the power consumption
    d) To improve the power factor

25. A reflex klystron functions as
    a) microwave amplifier
    b) microwave oscillators
    c) microwave amplifier and oscillator
    d) high gain cavity

26. Which of the following is minimized by laminating the core of a transformer?
    a) Eddy current loss
    b) Hysteresis loss
    c) Heat loss
    d) Copper loss

27. Mobility is defined as
    a) Diffusion velocity per unit field
    b) Drift velocity per unit field
    c) Displacement per unit field
    d) Number of free electrons / Number of bound electrons

28. The ideal voltage gain of voltage amplifier is
   a) 1
    b) < 1
    c) 0
    d) infinity

29. An independent voltage source in series with an impedance $Z_s = R_s - jX_S$ delivers a maximum average power to a load impedance Z_L when
    a) $Z_L = R_s + jX_S$
    b) $Z_L = R_s$
    c) $Z_L = jX_S$
    d) $Z_L = R_s - jX_S$

30. Two discrete time systems with impulse responses $h_1[n] = \delta[n-1]$ and $h_2[n] = \delta[n-2]$ are connected in cascade. The overall impulse response system of the cascaded system is
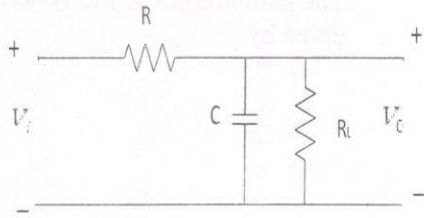   a) $\delta[n-1] + \delta[n-2]$
    b) $\delta[n-4]$
    c) $\delta[n-3]$
   d) $\delta[n-1]\,\delta[n-2]$

31. The current shown in the circuit is
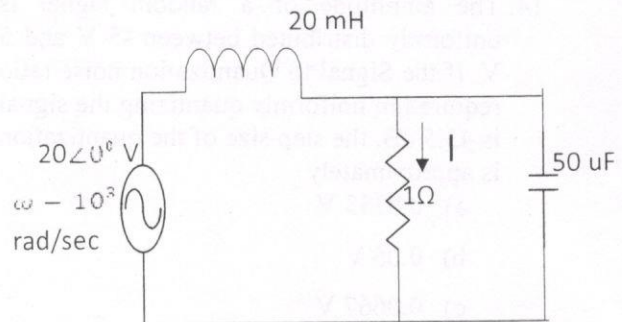
    a) -j1 A
    b) j1 A
    c) 0 A
    d) 20 A

32. If the transfer function of the following network is $\dfrac{V_0(s)}{V_i(s)} = \dfrac{1}{2+sCR}$, the value of the load resistance R_L is

  a) R/4
  b) R/2
  c) R
  d) 2R

33. An intrinsic semiconductor at the absolute zero of the temperature
  a) behaves like a metallic conductor
  b) has a large number of conductors
  c) behaves like an insulator
  d) has a large number of holes

34. The superposition principle is essentially based on the concept of
  a) non-linearity
  b) reciprocity
  c) duality
  d) linearity

35. A bistable multivibrator that functions as a voltage comparator with hysteresis is called
  a) JK Flip Flop
  b) T Flip Flop
  c) D Flip Flop
  d) Schmitt trigger

36. The logic circuit realized by the circuit shown in the given figure will be
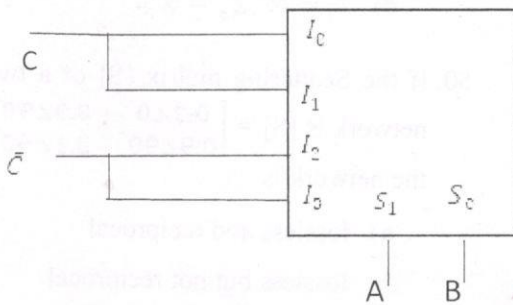
  a) B⊕C
  b) A⊕C
  c) A⊙B⊙C
  d) A⊕B

37. What are the minimum number of 2 to 1 multiplexers to generate a 2-input AND gate and a 2-input Ex-OR gate?
  a) 1 and 2
  b) 1 and 3
  c) 1 and 1
  d) 2 and 2

38. A continuous time LTI system is described by
$$\frac{d^2 y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 3\,y(t) = 2\frac{dx(t)}{dt} + 4\,x(t)$$
Assuming zero initial conditions, the response $y(t)$ of the above system for the input $x(t) = e^{2t}\,u(t)$ is given by
  a) $(e^t - e^{3t})\,u(t)$
  b) $(e^{-t} - e^{-3t})\,u(t)$
  c) $(e^{-t} + e^{-3t})\,u(t)$
  d) $(e^t + e^{3t})\,u(t)$

39. Group I lists four different semiconductor devices. Match each device in group I with its characteristic property in Group II
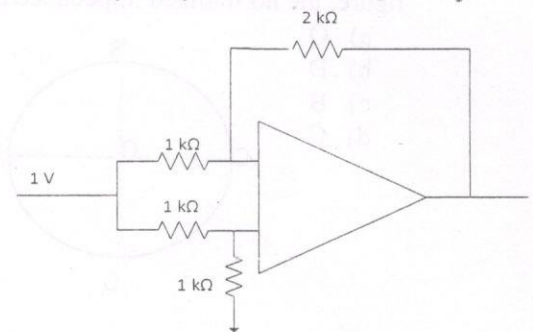
Group I	Group II
(P) BJT	(1) Population inversion
(Q) MOS Capacitor	(2) Pinch off Voltage
(R) LASER diode	(3) Early effect
(S) JFET	(4) Flat band Voltage

  a) P-3 Q-1 R-4 S-2
  b) P-1 Q-4 R-3 S-2
  c) P-3 Q-4 R-1 S-2
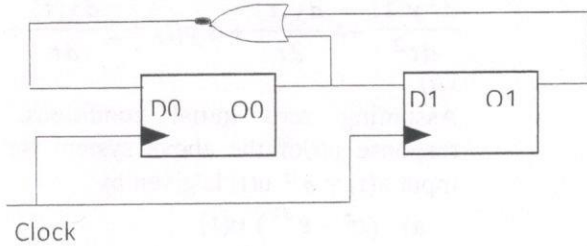 d) P-3 Q-2 R-4 S-4

40. For the Op-Amp circuit in the figure, V_0 is :

  a) -2 V
  b) -1 V
  c) -0.5 V
  d) 0.5 V

41. The Nyquist sampling rate for the signal
$s(t) = \dfrac{\sin(500\pi t)}{\pi t} \times \dfrac{\sin(700\pi t)}{\pi t}$ is given by
   a) 400 Hz
   b) 600 Hz
   c) 1200 Hz
   d) 1400 Hz

42. For the circuit shown, the counter state $(Q_1 Q_0)$ follows the sequence

Clock

   a) 00,01,10,11,00
   b) 00,01,10,00,01
   c) 00,01,11,00,01
   d) 00,10,11,00,10

43. An air filled rectangular waveguide has inner dimension of 3 cm × 2 cm. The wave impedance of the TE_{20} mode of propagation in the waveguide at a frequency of 30 GHz is (free space impedance $\eta_0 = 377\Omega$)

   a) 308 Ω
   b) 355 Ω
   c) 400 Ω
   d) 461 Ω

44. In the outline of the Smith Chart in the figure, the normalized impedance is
   a) O
   b) D
   c) B
   d) C
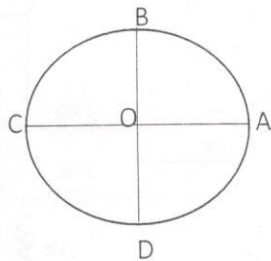
45. In delta modulation, the slope distortion can be reduced by
   a) decreasing the step size
   b) decreasing the granular noise
   c) decreasing the sampling rate
   d) Increasing the step size

46. The open loop transfer function of a unity gain feedback control system is given by
$$G(s) = \dfrac{K}{(s+1)(s+2)}$$
The gain margin of the system in dB is given by
   a) 0
   b) 1
   c) 20
   d) ∞

47. For transistor action
   a) the base region must be thin and lightly doped
   b) the base, emitter and collector regions should have similar size and doping concentrations
   c) the collector base junction is forward biased
   d) the collector region must be more heavily doped than the emitter region

48. The output of a logic gate is '1' when all the inputs are at logic '0'. The gate is either
   a) a NAND or an EX-OR gate
   b) a NOR or an EX-OR gate
   c) an AND or an EX-NOR gate
   d) a NOR or an EX-NOR gate

49. The input impedance (Z_i) and the output impedance (Z_o) of an ideal transconductance (Voltage Controlled Current Source) amplifier are

   a) $Z_i = 0, Z_o = 0$
   b) $Z_i = 0, Z_o = \infty$
   c) $Z_i = \infty, Z_o = 0$
   d) $Z_i = \infty, Z_o = \infty$

50. If the Scattering matrix [S] of a two-port network is $[S] = \begin{bmatrix} 0.2\angle 0^\circ & 0.9\angle 90^\circ \\ 0.9\angle 90^\circ & 0.1\angle 90^\circ \end{bmatrix}$ then the network is

   a) lossless and reciprocal
   b) lossless but not reciprocal
   c) not lossless but reciprocal
   d) neither lossless nor reciprocal

51. A full duplex operation permits the transmission
    a) in both directions at different times
    b) in both the directions at the same time
    c) in only one direction at the same time
    d) in only one direction at one time

52. Light travels along the optical fibers by which mechanism
    a) Refraction
    b) Reflection
    c) Scattering
    d) Total internal reflection

53. A 5-point sequence x[n] is given as
    x[3] = 1, x[-2] = 1, x[-1] = 0, x[0] = 5, x[1] = 1.
    Let $X(e^{j\omega})$ denote the discrete -time Fourier transform of x[n]. The value of $\int_{-\pi}^{\pi} X(e^{j\omega}) \, d\omega$ is:

    a) 5
    b) 10π
    c) 16π
    d) $5 + j10\pi$

54. The transfer function of a phase lead compensator is given by
    $G_c(s) = \dfrac{1+3Ts}{1+Ts}$ where $T > 0$
    The maximum phase shift provided by such a compensator is:
    a) $\dfrac{\pi}{2}$
    b) $\dfrac{\pi}{3}$
    c) $\dfrac{\pi}{4}$
    d) $\dfrac{\pi}{6}$

55. In digital communication system the data transmission rate is specified in
    a) MHz
    b) bits/second
    c) bytes/second
    d) bauds

56. The intrinsic impedance of a lossy dielectric medium is given by:
    a) $\dfrac{j\omega\mu}{\sigma}$
    b) $\sqrt{\dfrac{j\omega\mu}{\sigma+j\omega\varepsilon}}$
    c) $\dfrac{j\omega\varepsilon}{\mu}$
    d) $\sqrt{\dfrac{\mu}{\varepsilon}}$

57. A buck converter is:
    a) AC to DC converter
    b) AC to AC converter
    c) DC to DC converter
    d) Dc to AC converter

58. For a given JFET, the typical values of amplification factor and transconductance are given as 40 and 100 μs. The dynamic resistance of JFET will be:
    a) 200 Ω
    b) 400 Ω
    c) 200 kΩ
    d) 400 kΩ

59. A relaxation oscillator uses
    a) a PIN diode
    b) both a Tunnel diode and UJT
    c) a Tunnel diode
    d) UJT

60. If Z is the impedance of a simple dipole, the impedance of n fold dipole is given by
    a) nZ
    b) $n^2 Z$
    c) $\dfrac{Z}{n}$
    d) $\dfrac{Z}{n^2}$