Roll No. | | | | | | | | |

(Write Roll Number from left side exactly as in the Admit Card)

Signature of Invigilator

Question Booklet Series **X**

PAPER–II

Question Booklet No.
(Identical with OMR Answer Sheet Number)

Subject Code : 21

ELECTRONIC SCIENCE

Time : 2 Hours *Maximum Marks: 200*

Instructions for the Candidates

1. Write your Roll Number in the space provided on the top of this page as well as on the OMR Sheet provided.
2. At the commencement of the examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and verify it:
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page.
   (ii) Faulty booklet, if detected, should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.
   (iii) Verify whether the Question Booklet No. is identical with OMR Answer Sheet No.; if not, the full set is to be replaced.
   (iv) After this verification is over, the Question Booklet Series and Question Booklet Number should be entered on the OMR Sheet.
3. This paper consists of One hundred (100) multiple-choice type questions. All the questions are compulsory. Each question carries *two* marks.
4. Each Question has four alternative responses marked: (A) (B) (C) (D). You have to darken the circle as indicated below on the correct response against each question.

   Example: (A) (B) ● (D), where (C) is the correct response.
5. Your responses to the questions are to be indicated correctly in the OMR Sheet. If you mark your response at any place other than in the circle in the OMR Sheet, it will not be evaluated.
6. Rough work is to be done at the end of this booklet.
7. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Sheet, except in the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, such as change of response by scratching or using white fluid, you will render yourself liable to disqualification.
8. Do not tamper or fold the OMR Sheet in any way. If you do so, your OMR Sheet will not be evaluated.
9. You have to return the Original OMR Sheet to the invigilator at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. You are, however, allowed to carry question booklet and duplicate copy of OMR Sheet after completion of examination.
10. **Use only Black Ball point pen.**
11. **Use of any calculator, mobile phone, electronic devices/gadgets etc. is strictly prohibited.**
12. **There is no negative marks for incorrect answer.**

ELECTRONIC SCIENCE

PAPER II

1. In an intrinsic semiconductor the free electron concentration depends on

(A) effective mass of electrons only.

(B) effective mass of holes only.

(C) temperature of the semiconductor.

(D) width of the forbidden energy band of the semiconductor.

2. The static characteristics of an adequately forward biased *p-n* junction is a straight line, if the plot is of

(A) log I vs. log V

(B) log I vs. V

(C) I vs. log V

(D) I vs. V

3. The diffusion potential across *a p-n* junction

(A) decreases with increasing doping concentration.

(B) increases with decreasing band gap.

(C) does not depend on doping concentrations.

(D) increases with increase in doping concentration.

4. The early-effect in a bipolar junction transistor is caused by

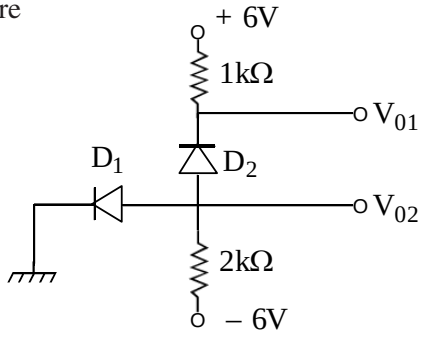
(A) fast turn-on.

(B) fast turn-off.

(C) large collector-base reverse bias.

(D) large emitter-base forward bias.

5. In the following circuit, the values of V_{01} and V_{02} in volts are



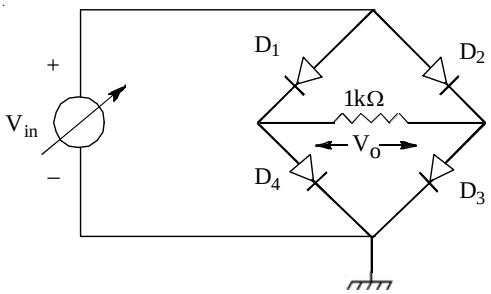
(A) $V_{01} = 6V$, $V_{02} = -6V$

(B) $V_{01} = 2V$, $V_{02} = 8V$

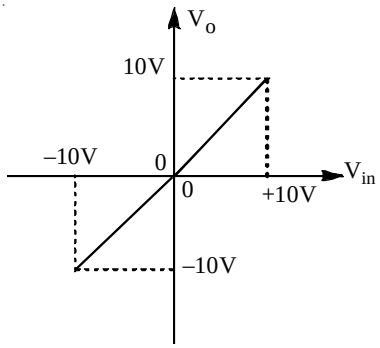
(C) $V_{01} = 2V$, $V_{02} = -2V$

(D) $V_{01} = 4V$, $V_{02} = 2V$

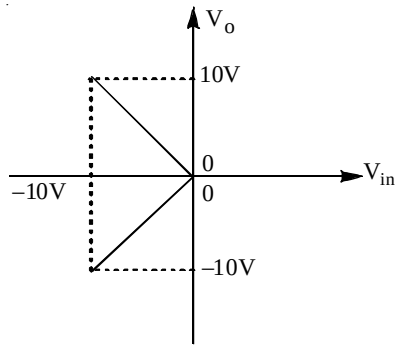
6. The diodes in the following circuit are ideal and the input voltage ranges from –10V to +10V. The correct transfer characteristics of the following circuit is



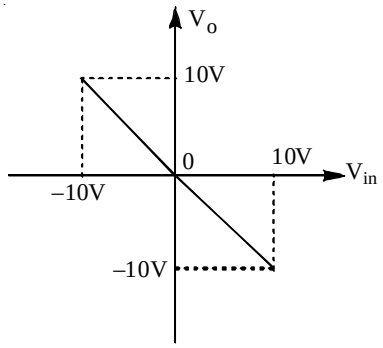
(A)



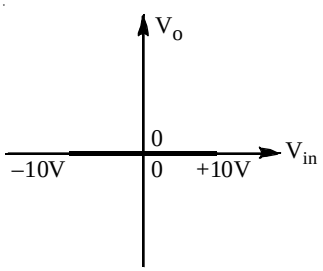
(B)



(C)



(D)



7. A *p*-type semiconductor has been highly doped by trivalent impurity so as to make it degenerate. The Fermi level of this semiconductor lies

(A) at the middle of the forbidden energy gap.

(B) somewhere in the middle of the forbidden energy gap and the top of the valence band.

(C) somewhere in the middle of the forbidden energy gap and the bottom of the conduction band.

(D) inside the valence band.

8. The holes in a semiconductor are

(A) particles like electrons with opposite charge.

(B) particles with a mass equal to the free electron mass at all positions of the energy bands.

(C) vacancies in an otherwise filled valence band.

(D) quasi-particles which can exist inside both the valence band and the conduction band.

9. Which of the following statements is not correct?

(A) A varactor diode can be used as a voltage variable capacitor.

(B) The depletion layer width of a *p-n* junction is voltage dependent.

(C) The junction capacitance of a *p-n* junction does not depend upon the bias voltage applied to the junction.

(D) The dynamic resistance of a forward biased *p-n* junction is current-dependent.

10. Metal deposition thickness does not depend on

(A) Impingement rate

(B) Mass of metal

(C) Density of metal

(D) Work function of metal

11. The oxidation rate for wet oxidation system is written as

(A) $\frac{dx}{dt} = \frac{1}{A + 2B(x - x_0)}$

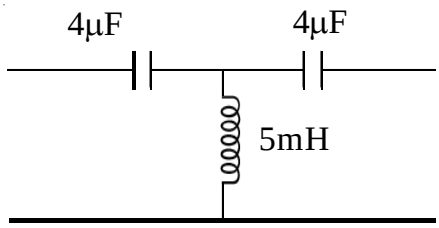
(B) $\frac{dx}{dt} = A + B(x - x_0)$

(C) $\frac{dx}{dt} = A + 2B(x - x_0)$

(D) $\frac{dx}{dt} = \frac{1}{A + B(x - x_0)}$

where A and B are constant, x = oxide thickness and x_0 = initial oxidation thickness.

12. The cut-off frequency of the following *T*-section filter in kHz is



(A) $\frac{1}{\pi}$

(B) $\frac{5}{2\pi}$

(C) π

(D) $\frac{\pi}{2}$

13. The inverse Fourier transform of the function $F(w) = \frac{1}{jw} + \pi\,\delta(w)$ is

(A) sin *wt*

(B) cos *wt*

(C) sin(*t*)

(D) u(*t*)

14. The Laplace transform of $e^t \sin(t)$

(A) $\dfrac{a}{a^2+(S+1)^2}$

(B) $\dfrac{a}{a^2+(S-1)^2}$

(C) $\dfrac{S+1}{a^2+(S+1)^2}$

(D) $\dfrac{S+1}{a^2-(S+1)^2}$

15. If $X(n)$ is a real sequence, then what is the value of $X_i(w)$

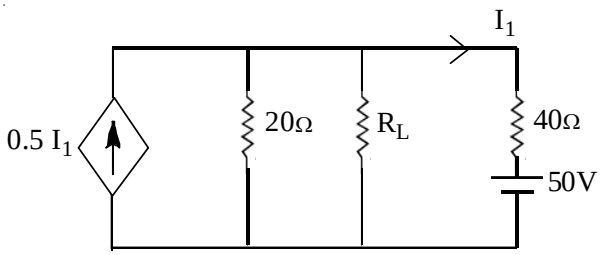
(A) $\sum_{n=-\infty}^{\infty} X(n)\sin(wn)$

(B) $-\sum_{n=-\infty}^{\infty} X(n)\sin(wn)$

(C) $\sum_{n=-\infty}^{\infty} X(n)\cos(wn)$

(D) $-\sum_{n=-\infty}^{\infty} X(n)\cos(wn)$

16. In the network of figure shown below, the maximum power is delivered to R_L if its value is



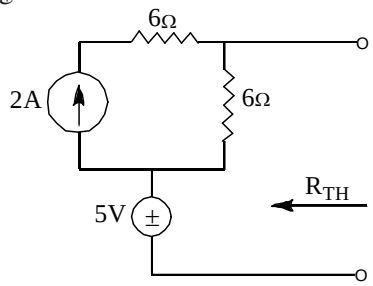
(A) 16 Ω

(B) $\dfrac{40}{3}\Omega$

(C) 60 Ω

(D) 20 Ω

17. Thevenin equivalent resistance R_{TH} of the following circuit is



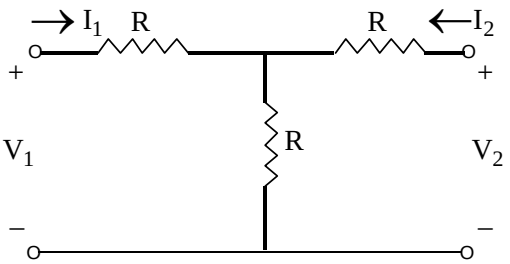
(A) 3Ω

(B) 12Ω

(C) 6Ω

(D) Infinity

18. h_{21} of the following network is



(A) $-\dfrac{3}{2}$

(B) $\dfrac{1}{2}$

(C) $-\dfrac{1}{2}$

(D) $\dfrac{3}{2}$

19. For a 2 port symmetrical bilateral network, if transmission parameters A = 3 and B = 1Ω, the value of parameter C is

(A) 3

(B) 8 S

(C) 8 Ω

(D) 9

20. An amplifier has a open-loop gain $A_o = 1000 \pm 100$. Apply feedback to design an amplifier whose voltage gain varies no more than $\pm 0{\cdot}1\%$. The gain with feedback is

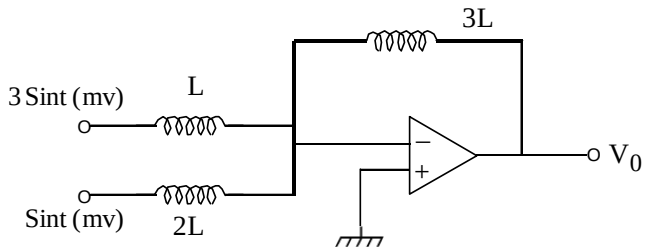
(A) 10

(B) 100

(C) 200

(D) 500

21. The output voltage (V_o) of the following circuit in millivolt is



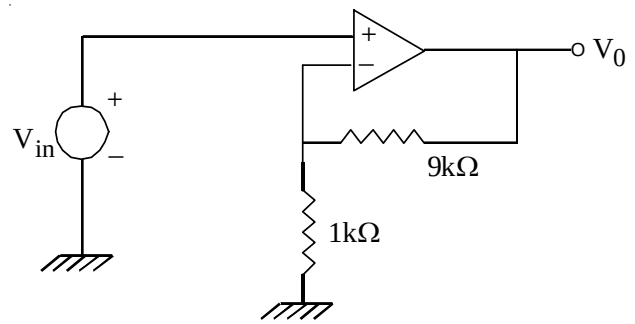
(A) – 3·5 sint

(B) – 12 sint

(C) – 7 sint

(D) – 10·5 sint

22. The gain-bandwidth product of the following Op-Amp is 1 MHz. The bandwidth of this amplifier is



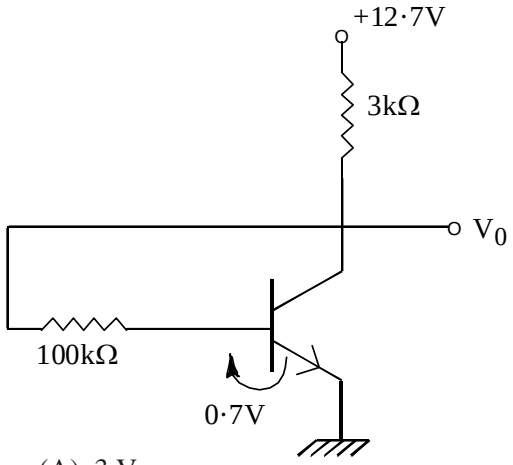
(A) 1 MHz

(B) 100 kHz

(C) 10 kHz

(D) 10 MHz

23. For the following transistor, $\beta = 99$. The value of the output voltage, V_o, in the following circuit is



(A) 3 V

(B) 1 V

(C) 3·7 V

(D) 0·7 V

24. MOSFET devices the *n*-channel type is better than the *p*-channel type in the following respects:

(A) It has better noise immunity.

(B) It is faster.

(C) It is TTL compatible.

(D) It has better drive capability.

25. One of the following is not the characteristics of a FET:

(A) Less temperature sensative

(B) Low noise

(C) Voltage gain is high when used as an amplifier

(D) Unipolar device

26. The 'pinch-off' voltage of a JFET is 5·0 volts, its 'cut-off' voltage is

(A) $(5{\cdot}0)^{1/2}$ V

(B) 2·5 V

(C) 5·0 V

(D) $(5{\cdot}0)^{3/2}$ V

27. In a transistor push-pull amplifier

(A) there is no dc present in the output.

(B) there is no distortion in the output.

(C) there is all even harmonics in the output.

(D) there is no odd harmonics in the output.

28. Negative feedback in amplifiers

(A) improves the signal to noise ratio at the input.

(B) improves the signal to noise ratio at the output.

(C) does not effect the signal to noise ratio at the output.

(D) reduces distortion.

29. FET is very popular as

(A) high gain amplifier.

(B) low noise amplifier.

(C) large gain bandwidth product type amplifier.

(D) low input impedance amplifier.

30. Two identical FETs, each characterized by the parameters g_m and r_d are connected in parallel. The composite FET is then characterized by the parameters.

(A) $\frac{g_m}{2}$ and r_d

(B) $\frac{g_m}{2}$ and $\frac{r_d}{2}$

(C) $2g_m$ and $\frac{r_d}{2}$

(D) $2g_m$ and $2r_d$

31. The Eber–Moll model is applicable to

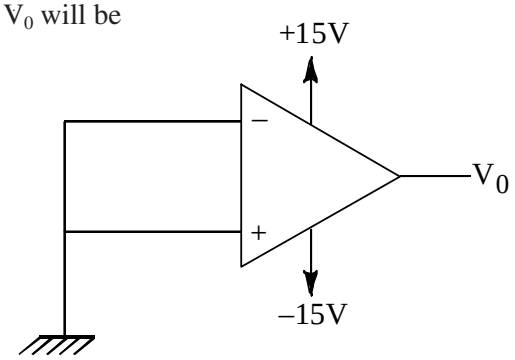
(A) Bipolar Junction Transistor

(B) NMOS Structure

(C) Unipolar Junction Transistors

(D) Junction Field Effect Transistor

32. If the Op-Amp in the figure has an input offset voltage of 5mV and an open loop voltage gain of 10,000; then V_0 will be



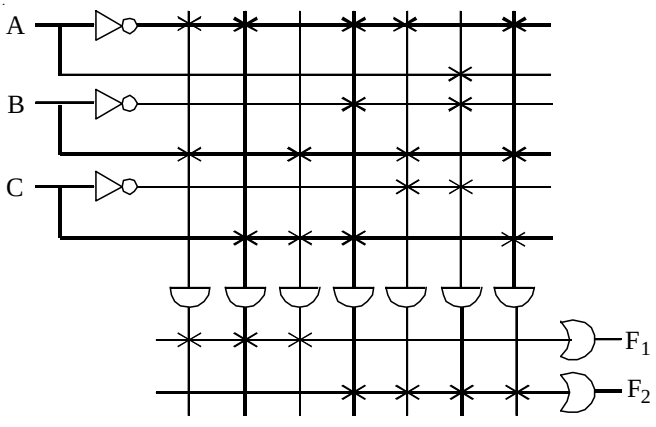
(A) 0 V

(B) 5 mV

(C) + 15V to –15 V

(D) + 50V to – 50 V

33. The combinational circuit implemented using PLA shown in the figure is



(A) Half Adder

(B) Half Subtractor

(C) Full Adder

(D) Full Subtractor

34. The simplified POS expression for the following Boolean function:

$F(A, B, C, D) = \pi_m(0, 1, 4, 6, 8, 14, 15)\, \pi_d(2, 3, 9)$ is

(A) $(A + D)(B + C + D)(\bar{A} + \bar{B} + \bar{C})$

(B) $(ACD + B)(A + B + C)$

(C) $(A + B + C)(\bar{A} + \bar{B})(A + C)$

(D) $(B + C)(A + D)(\bar{A} + \bar{B} + \bar{C})$

35. The NAND TTL 74LS00 has the following current ratings:

$I_{OL_{max}} = 15$ mA, $I_{IL_{max}} = -0{\cdot}6$ mA, $I_{OH_{max}} = -450$ μA, and $I_{IH_{max}} = 30$ μA.

The fan out of the gate will be

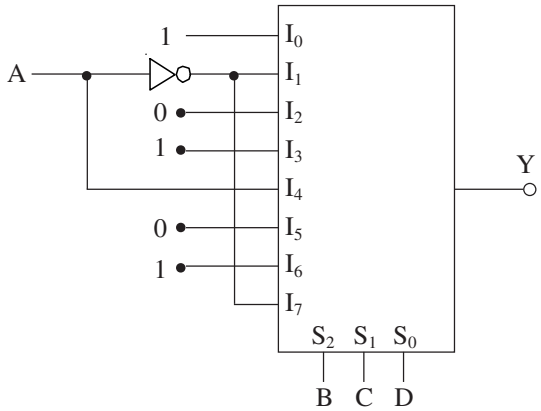
(A) 15

(B) 25

(C) 40

(D) 50

36. The Boolean function implemented in the following multiplexer circuit is



(A) $\sum m\,(0, 1, 3, 4, 6, 7)$

(B) $\sum m\,(1, 4, 9, 13, 15)$

(C) $\sum m\,(0, 1, 3, 6, 7, 8, 11, 12, 14)$

(D) $\sum m\,(2, 3, 5, 6, 10, 11, 13, 14)$

37. The simplification of the Boolean function

$F = A\bar{B}C + B + B\bar{D} + AB\bar{D} + \bar{A}C$ will be

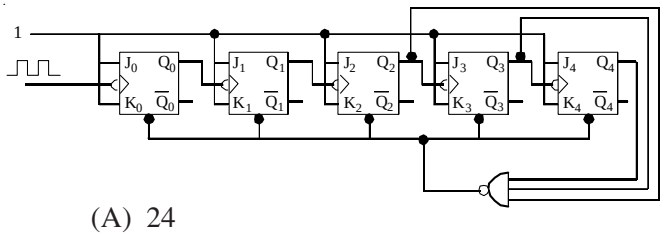
(A) B

(B) $\bar{A} + B$

(C) C + A

(D) B + C

38. An asynchronous counter is shown in the figure. The mode number of the counter is



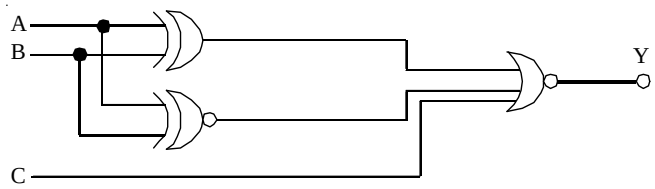
(A) 24

(B) 28

(C) 29

(D) 48

39. For the function Y to be 1 in the combinational circuit shown in the figure, the input combination is



(A) A = 1, B = 1, C = 0

(B) A = 1, B = 0, C = 0

(C) A = 0, B = 1, C = 0

(D) A = 0, B = 0, C = 1

40. It is required to count a pulse train having a frequency of 1 MHz using a modulo 1024 ripple counter. The maximum permissible propagation delay is

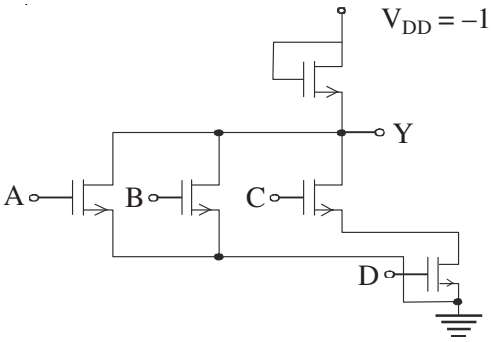
(A) 1 μs

(B) 10 μs

(C) 10 ns

(D) 100 ns

41. The Boolean function 'Y' implemented in the folowing circuit is



(A) (A + B + C) D

(B) ABC + D

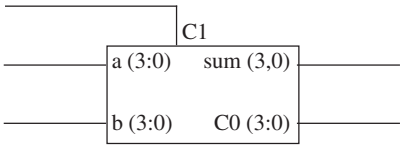
(C) $\overline{A + B + (\overline{CD})}$

(D) $(C + D)\,\overline{AB}$

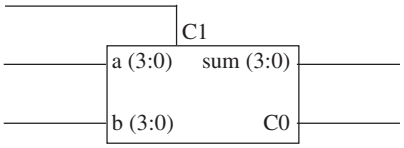
42. library ieee;
use ieee: std_logic_1164 all;
entity add4 is port (
a, b : in std_logic_vector (3 down to 0)
C1 : in std_logic
sum : out std_logic_vector (3 down to 0)
C0 : out std_logic);
end add4;

The symbolic equivalent circuit is shown in which figure?

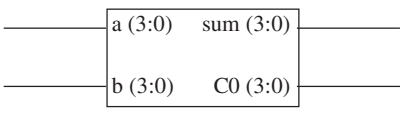
(A)



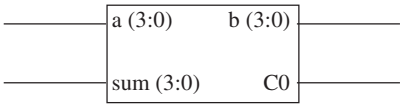
(B)



(C)



(D)



43. Conversion time of a certain A/D converter of the successive approximation type for digitizing an analogue signal that is 1/4th full scale value is 2·5μs. the conversion time for this converter for digitizing an analogue signal that is half of full scale value would be

(A) 5 μs

(B) 10 μs

(C) 1·25 μs

(D) 2·5 μs

44. In an antifuse FPGA, logic cell must consider

(A) more inputs (more than 4 inputs).

(B) more outputs (more than 4 outputs).

(C) less inputs and outputs (less than and equal to 4).

(D) more outputs and more inputs.

45. A binary multiplier is designed to multiply two 5 bit binary numbers. Size of ROM would be

(A) 64 × 4

(B) 1024 × 6

(C) 64 × 8

(D) 128 × 6

46. Which of the following signal is used when microprocessor wants to address the memory?

(A) I_o/M^1

(B) Status signal

(C) ALE

(D) HOLD and HLDA

47. Microprocessors are programmed using

(A) Assembly language

(B) Pascal

(C) High level language such as C, C++

(D) Fortran

48. A set of 8085 instructions is given below:

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

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

(A) (0, 1, 1)

(B) (1, 0, 0)

(C) (0, 1, 0)

(D) (1, 0, 1)

49. Consider the following loop:

```
LXI    B,    000AH
LOOP   :     DCX B
             MOV A, B
             ORA C
             JNZ LOOP
```

The loop is executed by

(A) 1 time

(B) 10 times

(C) 11 times

(D) Infinite times

50. The contents of the accumulator after the execution of following instruction will be

```
MVI    A,    A  7H
ORA    A
RLC
```

(A) C F H

(B) 4 F H

(C) 4 E H

(D) C E H

51. An 8k × 8 bit RAM is interfaced to an 8085 microprocessor. In the decoded scheme if the address of the last memory location of this RAM is 4FFFH, the address of the first memory location of the RAM will be

(A) 1000A

(B) 2000H

(C) 3000H

(D) 4000H

52. A microcontroller is to be programmed to generate a square waveform with minimum and maximum time periods of 100 nS and 10 mS. What is clock frequency required for the above?

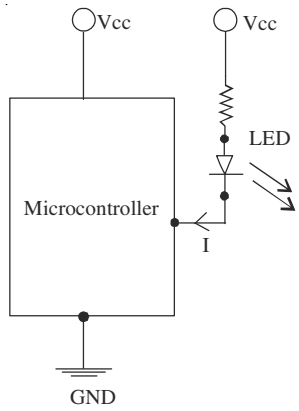
(A) 100 Hz

(B) 1 MHz

(C) 10 MHz

(D) 0·1 MHz

53. Find the resistance where I = 20 mA, V_{cc} = 5V V_{LED} = voltage across LED = 1·5V.



(A) 175 Ohm

(B) 1750 Ohm

(C) 17·5 Ohm

(D) 1780 Ohm

54. A 64k RAM chip can store

(A) 64000 bytes

(B) 65536 bytes

(C) 65536 bits

(D) 64000 bits

55. An n-type GaAs Gunn diode operates in the transit time mode with a frequency of oscillation equal to 10 GHz. The drift velocity of electrons is $2{\cdot}5\times10^7$ cm/sec. The length of the device in μm is

(A) 2·5

(B) 50

(C) 12·5

(D) 25

56. The attenuation constant of a network, $\alpha = 1$ neper. The value of α in dB will be

(A) 0

(B) 2·302

(C) 0·434

(D) 8·686

57. The phase velocity of a 2 kHz signal propagating on a distortionless transmission line having L and C as loop inductance and capacitance per unit length of the line respectively, can be expressed as

(A) $\frac{1}{\sqrt{LC}}$

(B) $\frac{1}{\sqrt{2LC}}$

(C) $\sqrt{LC}$

(D) $\sqrt{\frac{L}{C}}$

58. $[S_{ij}]$ is the scattering matrix of a lossless microwave circulator where i, j = 1, 2, 3. The wave flows from ports $1 \rightarrow 2 \rightarrow 3$ in the clockwise direction. S_{ij} is the scattering matrix element for the wave incident at part 'j' and emerging from port 'i'. The value of S_{13} will be

(A) 1

(B) 0

(C) $\frac{1}{2}$

(D) $\frac{1}{\sqrt{2}}$

59. Maxwell's fundamental contribution in the formulation of electromagnetic field equations was in the equation

(A) $\vec{\nabla}.\vec{B} = 0$

(B) $\vec{\nabla}.\vec{D} = \rho$

(C) $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$

(D) $\vec{\nabla} \times \vec{H} = -\frac{\partial \vec{D}}{\partial t} + \vec{J}$

(The symbols have their usual significances.)

60. An end-fire array of 8 half-wave dipole elements produces the principal lobe along the line of the array. The signal frequency is 1·5 GHz and the antenna elements are uniformly spaced with an inter-element spacing of 4λ. The width of the principal lobe of this array in radian is

(A) 1

(B) 0·5

(C) 2

(D) 0·75

61. A hollow metallic waveguide with its rectangular cross-section of 2 cm × 1 cm has its cut-off wavelength in cm for the TE_{10} mode equal to

(A) 4

(B) 1

(C) 2

(D) 0·5

62. A hollow, metallic waveguide with rectangular cross-section of 4 cm × 3 cm. The ratio of cut-off frequencies for TE_{10} and TM_{11} modes is

(A) 1 : 8

(B) 2 : 5

(C) 3 : 4

(D) 3 : 5

63. A two-cavity klystron amplifier using identical buncher and catcher cavities and operating at 5GHz has the following parameter values.

DC accelerating voltage, $V_{dc} = 200$ V cavity gap width, d = 1mm

The value of the beam coupling coefficient of the buncher cavity is

(A) 0·921

(B) 0·357

(C) 0·509

(D) 0·715

64. A TWT amplifier is designed to amplify 8 GHz microwave signal and it operates with a dc accelerating voltage of 1000 volts. The dc electron beam current is 15mA. The helix has a length of 7 cm and a characteristic impedance of 20 Ω. The power gain of the TWT in dB is

(A) 49·92

(B) 29·86

(C) 53·15

(D) 59·46

65. A cylindrical magnetron having a cathode radius of 6 cm and anode radius of 12 cm measured from the centre of the cathode is operated with a crossed magnetic field with magnetic flux density of 2 mWeber/m^2. The cut-off anode voltage of this magnetron in volt is

(A) 564

(B) 900

(C) 712

(D) 1200

66. You are asked to increase the maximum range of the pulsed radar by increasing the transmitter Peak Power only. To double the existing maximum range of this radar, the transmitter Peak Power has to be increased by a factor of

(A) 4

(B) 8

(C) 32

(D) 16

67. An MTI radar operates at 3 GHz with a pulse repetition frequency of 1 kHz. The first blind speed of this radar in km/hour is

(A) 120

(B) 180

(C) 360

(D) 720

68. Blind speed of a radar —

(A) Radar rotates at such a high speed it cannot see anything.

(B) The target is moving at such a high speed that phase differences between successive pulses will be zero.

(C) Target is at such a distance radar cannot see it.

(D) All the above statements are correct.

69. Side lobe of an antenna pattern causes

(A) reduced bandwidth.

(B) reduced antenna gain.

(C) ambiguity in direction finding.

(D) increased antenna gain.

70. The type of radar that is used to eliminate clutter in navigational application is

(A) MTI radar

(B) Pulse radar

(C) Monopulse radar

(D) Tracking radar

71. If 'f_c' be cut-off frequency of the waveguide and 'f' be the operating frequency then

(A) $f = f_c$

(B) $f < f_c$

(C) $f > f_c$

(D) $f << f_c$

72. The degenerated modes in a waveguide are characterized by

(A) same cut-off frequencies and same field distributions.

(B) same cut-off frequencies and different field distributions.

(C) different cut-off frequencies but same field distributions.

(D) different cut-off frequencies and different field distributions.

73. The wavelength of electromagnetic waves in a waveguide

(A) is inversely proportional to the phase velocity.

(B) is greater than that in free space.

(C) is directly proportional to the phase velocity.

(D) depends only on the waveguide dimensions and free space wavelength.

74. Condition for minimum attenuation is

(A) RG = LC

(B) RC = LG

(C) GC = LR

(D) RL = GC

75. The magnetic field at a distance r from the center of the wire is proportional to

(A) r for $r < a$ and $1/r^2$ for $r > a$

(B) 0 for $r < a$ and $1/r$ for $r > a$

(C) r for $r < a$ and $1/r$ for $r > a$

(D) 0 for $r < a$ and $1/r^2$ for $r > a$

76. Vector potential is a vector

(A) whose curl is equal to the magnetic flux density.

(B) whose curl is equal to the electric field intensity.

(C) whose divergence is equal to the electric potential.

(D) which is equal to the vector product E × H.

77. For an ideal waveguide if reflection coefficient $\Gamma = 1$, then the correspoinding value of VSWR is

(A) 0

(B) 1

(C) ½

(D) ∞

78. The magnitudes of the open-circuit and short-circuit input impedances of a transmission line are 100 Ω and 25 Ω respectively. The characteristic impedance of the line is

(A) 25 Ω

(B) 50 Ω

(C) 75 Ω

(D) 100 Ω

79. To overcome difficulties with strapping high frequencies, the type of cavity structure desired for magnetron is

(A) hole and slot

(B) slot

(C) vane

(D) rising sun

80. The following diode does not use negative resistance in its operation:

(A) Gunn diode

(B) Tunnel diode

(C) Backward diode

(D) IMPATT diode

81. The major advantage of TWT over a klystron lies in the

(A) higher bandwidth

(B) higher gain

(C) higher frequency

(D) higher output power

82. A 10kW carrier is sinusoidally modulated by two modulating signals corresponding to a modulation index of 30% and 40% respectively. The total radiated power is

(A) 11·25 kW

(B) 12·5 kW

(C) 15 kW

(D) 17 kW

83. The Fourier transform of a conjugate symmetric function is always

(A) Real
(B) Imaginary
(C) Conjugate anti-symmetric
(D) Conjugate symmetric

84. The orbital motion of a satellite is governed by

(A) Maxwell's equations
(B) Euler equations
(C) Kepler's laws
(D) Newton's laws

85. The probabilities of transmitted symbols from a zero-memory source are given by p_1=0·5, p_2=0·25, p_3= p_4= 0·125. The entropy of the source is

(A) 2 bit
(B) 1 bit
(C) 0·75 bit
(D) 1·75 bit

86. The attenuation of the optical fiber used in an optical fiber link is 0·8 dB/km. When an optical power of 150 mw is connected at the input, the output power results 10 mw. The maximum optical fiber length of the link is

(A) 12·7 km
(B) 14·7 km
(C) 20·5 km
(D) 25·7 km

87. The bulk carrier recombination life time for a GaAlAs LED is 25 nS and the LED emits an optical power of 250 μw at constant DC current. The optical power output of the LED when modulate data frequency of 120 MHz is

(A) 13·24 μw
(B) 16·27 μw
(C) 35·82 μw
(D) 40·52 μw

88. A system has three stage cascaded amplifier, each stage having a power gain of 20dB and noise figure of 6dB. The overall noise figure is

(A) 1·38
(B) 6·8
(C) 4·33
(D) 10·43

89. Three analog signals, having bandwidths 1200 Hz, 600 Hz and 600 Hz, are sampled at their respective nyquist rates, encoded with 12 bit words, and time division multiplexed. The bit rate for the multiplexed signal is

(A) 57·6 kbps
(B) 115·2 kbps
(C) 28·8 kbps
(D) 38·4 kbps

90. In a PCM system, the number of quantization levels is 16 and the maximum signal frequency is 4 kHz; the bit transmission rate is

(A) 32 bits/s
(B) 16 bits/s
(C) 64 kbits/s
(D) 32 kbits/s

91. An optical power of 120 μw is launched into a single input port of a 16 × 16 fused fiber star coupler. The power measured at the output port is 10 μw. The splitting loss of the coupler is

(A) 0·97 dB
(B) 10·8 dB
(C) 12·04 dB
(D) 0·77 dB

92. A silicon PIN photodetector has a junction capacitance of 18pF, active area of 12 mm^2 and a responsivity of 0·6 A/W. When it is illuminated with an optical power of 0·5 mw /cm^2, the voltage obtained across a load resistance of 120 kΩ would be

(A) 5·8 V
(B) 6·8 V
(C) 4·3 V
(D) 2·7 V

93. A resistance strain gauge has a gauge factor of 2·8 and it is fastened to a steel member subjected to a stress of 120 N/mm^2. The modulus of elasticity of steel is $2{\cdot}5 \times 10^5$ N/mm^2. The percentage change in resistance is

(A) 1·12
(B) 0·02
(C) 0·336
(D) 0·134

94. Two wattmeters are connected to a three phase system supplying a balanced load and the readings are 10·5 kW and 2·5 kW respectively. The total power and power factor are

(A) 8·0 kW and 0·52
(B) 8·0 kW and 0·335
(C) 13·0 kW and 0·334
(D) 13·0 kW and 0·684

95. A signal 12 coswt + 6 cos2wt is applied on a spectrum analyzer. In the analyzer, it will be seen as

(A) a single waveform like a rectangular pulse.
(B) two waveform of w and 2w.
(C) a spike of 18 volts at w and 2w.
(D) two spikes of 12 volts at w and 6 volts at 2w.

96. An oscilloscope has 50 mV/ divn. and a square pulse is applied to its vertical plate. In the output, the leading edge has 3·5 divisions and trailing edge 3 divisions. The tilt is

(A) 13·9 %
(B) 15·4 %
(C) 16·6 %
(D) 20·5 %

97. An accelerometer has a scismic mass of 0·05kg and spring constant of $3{\times}10^3$ N/m. If maximum displacement of mass is ± 1 mm, the maximum acceleration which can be measured is

(A) 120 m/Sec^2
(B) 90 m/Sec^2
(C) 60 m/Sec^2
(D) 30 m/Sec^2

98. Potentiometer sensitivity can be increased by

(A) decreasing the current in potentiometer wire.
(B) increasing the length of potentiometer wire.
(C) decreasing the length of potentiometer wire.
(D) replacing the standard cell by a regulated power supply.

99. The TRIAC can be used only in

(A) inverter
(B) rectifier
(C) multi-quadrant chopper
(D) cycloconverter

100. The entries in the first column of Routh array of a fourth order are 5, 2, – 0·1, 2, 1. The number of poles in the right half plane are

(A) 1
(B) 2
(C) 3
(D) 4

ROUGH WORK

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