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

Signature of Invigilators

1. \_\_\_\_\_

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**2117**

Question Booklet Series

**X**

PAPER-II

Question Booklet No.

(Identical with OMR Answer Sheet Number)

Subject Code : 21

## ELECTRONIC SCIENCE

Time : 1 Hour 15 Minutes

Maximum Marks: 100

### Instructions for the Candidates

- Write your Roll Number in the space provided on the top of this page as well as on the OMR Sheet provided.
- 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:
  - To have access to the Question Booklet, tear off the paper seal on the edge of this cover page.
  - Faulty booklet, if detected, should be get 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.
  - Verify whether the Question Booklet No. is identical with OMR Answer Sheet No.; if not, the full set to be replaced.
  - After this verification is over, the Question Booklet Series and Question Booklet Number should be entered on the OMR Sheet.
- This paper consists of fifty (50) multiple-choice type questions. All the questions are compulsory. Each question carries *two* marks.
- 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.
- 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.
- Rough work is to be done at the end of this booklet.
- If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Sheet, except 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.
- Do not tamper or fold the OMR Sheet in any way. If you do so, your OMR Sheet will not be evaluated.
- 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.
- Use only Black Ball point pen.**
- Use of any calculator or mobile phone etc. is strictly prohibited.**
- There are no negative marks for incorrect answers.**

[Please Turn Over]



## ELECTRONIC SCIENCE

## PAPER II

1. If band gap of InGaAsP is 0.95 eV, what will be the peak emission wavelength of LED made of InGaAsP?

- (A) 1305 nm
- (B) 845 nm
- (C) 955 nm
- (D) 1550 nm

2. For dividing the clock frequency by 8, one requires 'n' number of J-K flip flops each operating in the toggle mode, where 'n' equals to

- (A) 8
- (B) 4
- (C) 2
- (D) 3

3. In free space, the electric field of an EM wave is  $\vec{E} = 10 \cos(\omega t - 50x) \hat{k} \text{ V/m}$ , the frequency of the wave is

- (A)  $1.5 \times 10^{10} \text{ rad/s}$
- (B)  $2.0 \times 10^{10} \text{ rad/s}$
- (C)  $3.0 \times 10^8 \text{ rad/s}$
- (D)  $1.5 \times 10^8 \text{ rad/s}$

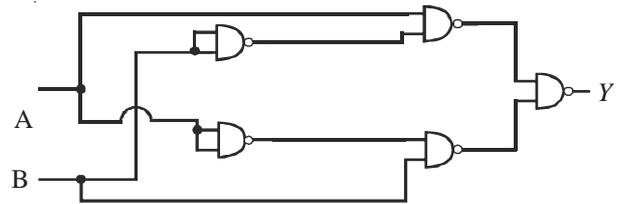
4. A half-wave dipole antenna in the form of a straight wire is fed at the centre by a sinusoidally varying current. The maximum radiation takes place in a plane

- (A) passing through and containing the straight antenna wire.
- (B) inclined at an angle of  $45^\circ$  with the length of the antenna wire.
- (C) perpendicular to the length of the antenna wire.
- (D) inclined at an angle of  $60^\circ$  with the length of the antenna wire.

5. The two wavelengths  $\lambda_1 = 1.30 \mu\text{m}$  and  $\lambda_2 = 1.55 \mu\text{m}$  are important in case of simple mode fiber optic communication system because

- (A) for  $\lambda_1$  glass shows lowest loss and for  $\lambda_2$  lowest dispersion.
- (B) for  $\lambda_1$  glass shows lowest dispersion and for  $\lambda_2$  lowest loss.
- (C) for  $\lambda_1$  glass shows lowest loss but for  $\lambda_2$  highest dispersion.
- (D) for  $\lambda_1$  glass shows highest loss but for  $\lambda_2$  lowest dispersion.

6. The Boolean function of the following circuit is



- (A)  $A \oplus B$
- (B)  $A + B$
- (C)  $A \odot B$
- (D)  $A B$

7. The Laplace transform of the function given in terms of unit step function as  $F(t) = U(t-a) - U(t-b)$ , where  $a$  and  $b$  are constants and  $a > b > 0$  is obtained as

- (A)  $\frac{1}{s} [e^{-as} - e^{-bs}]$
- (B)  $\frac{1}{s^2} [e^{-as} - e^{-bs}]$
- (C)  $\frac{1}{s} [e^{-bs} - e^{-as}]$
- (D)  $e^{-as} - e^{-bs}$

8. What is the proper measurement of average power emitted by a pulsed laser?

- (A) Energy  $\times$  Time
- (B) Pulse Energy  $\times$  Repetition Rate
- (C) Pulse Energy / Repetition Rate
- (D) Peak Power  $\times$  Pulse Length

9. How does a semiconductor laser operate when the drive current is below laser threshold?

- (A) A reverse-biased diode
- (B) As a photodiode
- (C) As a perfect insulator
- (D) As a forward biased diode

10. What type of semiconductor junction can function as a laser?

- (A) Unbiased junction
- (B) Reverse-biased junction
- (C) Reverse-biased junction in breakdown condition
- (D) Forward-biased junction

11. In CMOS inverter, the power dissipation is

- (A) low only when  $V_{in}$  is low.
- (B) low only when  $V_{in}$  is high.
- (C) high during dynamic operation.
- (D) low during dynamic operation.

12. For a J-K flip-flop,  $Q_n$  is the output at time step  $t_n$ . What will be the Boolean expression for  $Q_{n+1}$ ?

- (A)  $J_n Q_n + \bar{K}_n \bar{Q}_n$
- (B)  $J_n Q_n + K_n \bar{Q}_n$
- (C)  $\bar{J}_n Q_n + K_n \bar{Q}_n$
- (D)  $J_n \bar{Q}_n + \bar{K}_n Q_n$

13. The address-of operator and the indirection operator used in pointers related to C program are denoted, respectively, as

- (A) \* , %
- (B) \* , ==
- (C) & , \*
- (D) \* , &

14. What will be the output of the following for loop, if presented in proper C program?

```
for(counter =10, counter >=1, counter --) ...
```

- (A) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
- (B) 2, 4, 6, 8, 10
- (C) 10, 9, 8, 7, 6, 5, 4, 3, 2, 1
- (D) 1, 3, 5, 7, 9

15. The Laplace transform of  $\delta(t)$  is

- (A) 0
- (B)  $e^{-St}$
- (C)  $t^2$
- (D) 1

16. Sensitivity of LVDT (displacement measuring instrument) is mainly due to

- (A) magnetic shielding of the core.
- (B) permeability of the core.
- (C) exact cancellation of secondary voltage.
- (D) insulation used in the winding.

17. The coil of a moving coil meter is wound on

- (A) an aluminum frame
- (B) an iron frame
- (C) an insulating material
- (D) a semiconductor material

18. Accuracy is defined as

- (A) the measure of consistency of measurement.
- (B) closeness with which an instrument reading approaches the true value of the parameter being measured.
- (C) the smallest measurable input change.
- (D) the ratio of the change in output signal of an instrument to the change in the input.

19. Shunt type ohmmeter is used for the measurement of

- (A) very high value of resistance.
- (B) the medium value of resistance.
- (C) very low value of resistance.
- (D) extremely very high value of resistance.

20. Different colour lights in CRO screen are due to

- (A) different colour glasses used on the screen.
- (B) different isotopes of phosphor material used to coat the glass screen.
- (C) liquid crystal.
- (D) different coloured LEDs are used in the display.

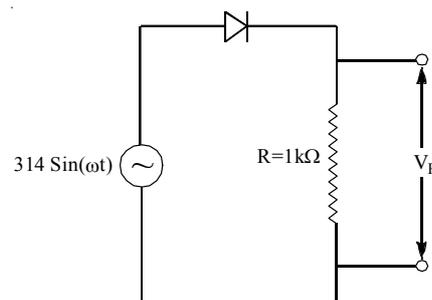
21. Which of the following statement is not correct for open control system?

- (A) Input command is the sole factor responsible for providing the control action.
- (B) Presence of non-linearities causes malfunctioning.
- (C) Control action is independent of output.
- (D) Control action is dependent of output.

22. The transfer function is applicable to which of the followings:

- (A) Linear and time variant system
- (B) Linear time invariant system
- (C) Linear system
- (D) Non-linear system

23. The minimum peak reverse voltage of the following half wave rectifier is

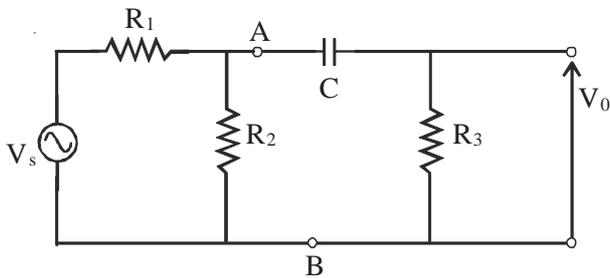


- (A) 157 V
- (B) 314 V
- (C)  $314\sqrt{2}$  V
- (D)  $157\sqrt{2}$  V

24. The cascode amplifier is a multistage configuration of

- (A) CC – CB
- (B) CE – CB
- (C) CB – CC
- (D) CE – CE

25. By using Thevenin's theorem, the voltage across A and B in the following circuit is



- (A)  $\frac{V_s R_1}{R_1 + R_2}$
- (B)  $\frac{V_s R_3}{R_1 + R_2}$
- (C)  $\frac{V_s R_3}{(R_1 + R_2) \left( R_3 + \frac{1}{sC} \right)}$
- (D)  $\frac{V_s R_2}{R_1 + R_2}$

26. If spacing between the wires of a transmission line is increased, its characteristic impedance

- (A) will increase
- (B) will decrease
- (C) is unaffected
- (D) has no relation with the distance between the line

27. A transmission line of infinite length and characteristic impedance  $Z_0$  has an input impedance equal to

- (A) infinity
- (B) zero
- (C)  $Z_0$
- (D)  $Z_0/2$

28. The frequency of oscillation of a reflex Klystron depends on

- (A) cavity dimension
- (B) d.c. voltage
- (C) distance between cavity and repeller
- (D) repeller voltage

29. In a hollow metallic waveguide with rectangular cross-section,

- (A) TEM mode can not exist.
- (B)  $TE_{12}$  is the dominant mode.
- (C)  $TM_{11}$  mode will always propagate irrespective of the dimension of the waveguide cross-section.
- (D) TEM mode is possible if the waveguide is air-filled.

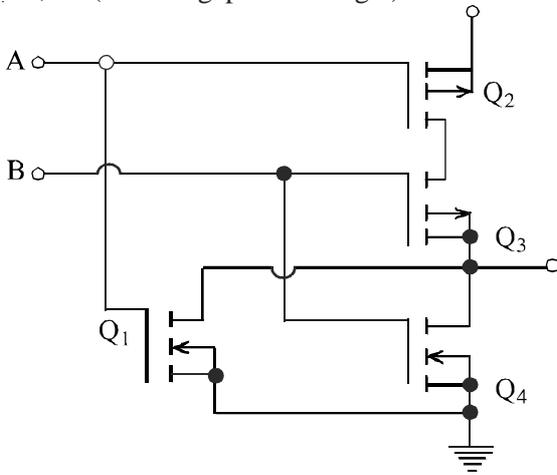
30. In a reflex Klystron, an interaction takes place between the

- (A) electric field and the magnetic field.
- (B) two groups of electrons.
- (C) electrons and the microwave field, which is known as beam-field interaction.
- (D) magnetic fields of a pair of resonant cavities.

31. In a cylindrical magnetron, the cut-off magnetic field is proportional to the

- (A) inverse of the dc anode voltage.
- (B) dc anode voltage.
- (C) square-root of the dc anode voltage.
- (D) square of the dc anode voltage.

32. The logic statement for the CMOS gate shown, where  $Q_1$  and  $Q_4$  are n-MOS, and  $Q_2$  and  $Q_3$  are p-MOS, is (assuming positive logic)



- (A) NOR
- (B) NAND
- (C) XOR
- (D) AND

33. An AM signal (DSB + C) accompanied by band limited white noise is detected in an envelope detector. The AM indexed is chosen to be 100%. The ratio of output signal to noise power ratio to the input signal to noise power ratio is

- (A) 1
- (B)  $\frac{1}{2}$
- (C)  $\frac{1}{3}$
- (D)  $\frac{2}{3}$

34. An FM signal and an AM signal use identical carrier. The AM index is 100%. The ratio of output signal to noise power ratios in FM and AM systems operating with band limited white noise at the output are proportional to

- (A) FM index
- (B) square of FM index
- (C) square root of FM index
- (D)  $\frac{1}{\text{FM index}}$

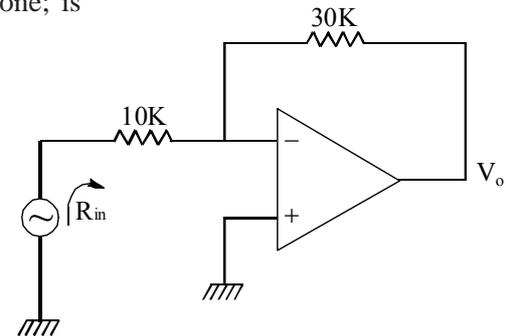
35. A format for digital modulation is

- (A) FM
- (B) AM
- (C) FSK
- (D) PAM

36. A magic-T used in microwave communication

- (A) has a scattering matrix whose diagonal elements are all '1'.
- (B) has four ports which are not matched so that reflection takes place.
- (C) is actually a combination of four Tees.
- (D) produces half power divisions of the signal at the hybrid junction.

37. The input resistance  $R_{in}$  of the amplifier is shown in the figure below, where the OP-AMP is an ideal one; is

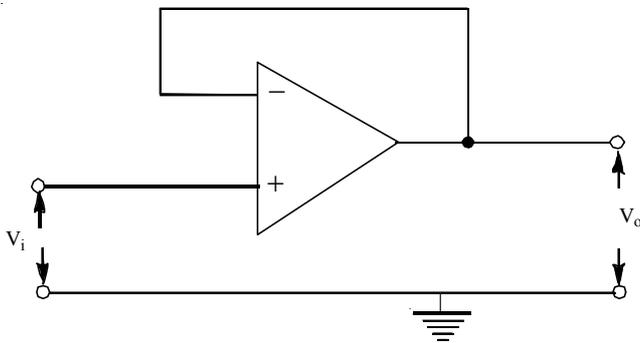


- (A)  $30/4 \text{ k}\Omega$
- (B) 10k
- (C) 40 k $\Omega$
- (D) Infinite

38. The critical frequency of an ionospheric layer having an electron density of  $2.5 \times 10^5/\text{cm}^3$  is

- (A) 9 MHz
- (B) 5 MHz
- (C) 4.5 MHz
- (D) 5.5 MHz

39. The basic function of the following OP-AMP circuit



- (A) acts as a low impedance buffer with unity gain.
- (B) acts as a high impedance buffer with unity gain.
- (C) acts as a low impedance buffer with gain equal to the open loop gain of the OP-AMP.
- (D) acts as a high impedance buffer with gain equal to the open loop gain of the OP-AMP.

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

- (A)  $\log I$  versus  $\log V$
- (B)  $\log I$  versus  $V$
- (C)  $I$  versus  $\log V$
- (D)  $I$  versus  $V$

41. The ideal OP-AMP has the following characteristics:

- (A)  $R_i = \infty$ ;  $A = \infty$ ;  $R_o = 0$
- (B)  $R_i = 0$ ;  $A = \infty$ ;  $R_o = 0$
- (C)  $R_i = \infty$ ;  $A = \infty$ ;  $R_o = \infty$
- (D)  $R_i = 0$ ;  $A = \infty$ ;  $R_o = \infty$

42. The output of the program is

```
# include <stdio.h>
int main ( )
{
    int i = 5;
    int l = 2/4;
    int k = i/-4;
    Printf ( " % d %d\n, l, k);
    return 0;
}
```

- (A) -1 1
- (B) Compile time error
- (C) 1 -1
- (D) 1.000 -1.0000

43. If  $MN / MX$  is low, the 8086 operates in the following mode:

- (A) Maximum
- (B) Minimum
- (C) Medium
- (D) Normal

44. Which general purpose register holds eight bit divisor and stores the remainder especially after the execution of division operation?

- (A) A-Register
- (B) B-Register
- (C) Registers  $R_0$  through  $R_7$
- (D) Both A and B Register

45. Which register of 8031 micro-controller usually stores the output generated by ALU in several arithmetic and logical operation?

- (A) Accumulator
- (B) Special function
- (C) Register
- (D) Stack pointer

46. While splicing of two optical fibers, the most crucial offset parameter is

- (A) Transverse offset
- (B) Longitudinal offset
- (C) Angular offset
- (D) Azimuthal offset

47. When the gate to source voltage  $V_{gs}$  of a  $p$ -channel JFET is made more positive, the drain current

- (A) increases
- (B) decreases
- (C) remains constant
- (D) may increase or decrease

48. In a saturation region operation of a Bipolar Junction Transistor,

- (A) both junctions are reverse biased.
- (B) both junctions are forward biased.
- (C) emitter junction is reverse biased while collector junction is forward biased.
- (D) emitter junction is forward biased while collector junction is reverse biased.

49. In a silicon monolithic IC, isolation

- (A) produces a high resistance but only between active elements.
- (B) is not necessary because the silicon substrate has a high resistivity.
- (C) is necessary because silicon is electrically conducting partially.
- (D) separates component mechanically.

50. The cut in voltage of a diode is equal to

- (A) applied forward biased voltage.
- (B) applied reverse biased voltage.
- (C) barrier potential.
- (D) voltage produced by majority carrier.

*2117-II*

**X-10**

**ROUGH WORK**

**X-11**

**2117-II**

**ROUGH WORK**

*2117-II*

**X-12**

**ROUGH WORK**