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M.Sc. (Second Semester)
EXAMINATION, May - June. 2022
PHYSICS
Paper Third
(Electronics and Photonic Devices and Optical Modulators)

Time : Three Hours]   [Maximum. Marks:80

Note: Attempt all sections as directed.

Section - A

(Objective/Multiple Choice Questions)

(1 mark each)
Note: Attempt all questions. Choose the correct answer.

1. When SCR is off, the current in the circuit is:

   (A)   Exactly Zero

   (B)   Small leakage current

   (C)   Large leakage current

   (D)   None of the above

2. The formula for a.c. drain resistance of a JFET is:

   (A) $\dfrac{\Delta V_{DS}}{\Delta I_D}$ at constant V_{GS}

   (B) $\dfrac{\Delta V_{GS}}{\Delta I_D}$ at constant V_{DS}

   (C) $\dfrac{\Delta I_D}{\Delta V_{GS}}$ at constant V_{DS}

   (D) $\dfrac{\Delta I_D}{\Delta V_{DS}}$ at constant V_{GS}

3. A Triac is a ....switch

   (A)   Bidirectional

   (B)   Unidirectional

   (C)   Mechanical

   (D)   None of the above

4. A Triac is equivalent to two SCR..........

   (A)   In Parallel

   (B)   In series

   (C)   In inverse parallel

   (D)   None of the above

5. The UJT may be used as............

   (A) An amplifier

   (B) A sawtooth generator

   (C) A rectifier

   (D) None of the above

6. The drain current - I_D in a JFET is given by:

   (A) $I_D = I_{DSS} \left[1 - \dfrac{V_{GS}}{V_p} \right]^2$

   (B) $I_D = I_{DSS} \left[1 + \dfrac{V_{GS}}{Vp} \right]^2$

   (C) $I_D = I_{DSS} \left[1 - \dfrac{Vp}{V_{GS}} \right]^2$

   (D) $I_D = I_{DSS} \left[1 + \dfrac{Vp}{V_{GS}} \right]^{1/2}$

7. A MOSFET can be operated with..........

   (A) Negative gate voltage only

   (B) Positive gate voltage only

   (C) Positive as well as negative gate voltage

   (D) None of the above

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P.T.O.

8. IMPATT diode is

   (A) A negative conductance microwave device

   (B) A high frequency rectifying device

   (C) A degenerate semiconductor device

   (D) A bulk negative differential device

9. Gunn diode is utilized in

   (A) An audio oscillator

   (B) An audio amplifier

   (C) The RF oscillator

   (D) The microwave Oscillator

10. Solar cell works in

    (A) I - Quadrant

    (B) II - Quadrant

    (C) III - Quadrant

    (D) IV - Quadrant

11. Photodetector is a ....device

    (A) Triangular device

    (B) Square law device

    (C) Linear device

    (D) Both (A) & (B)

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12. What are three relevant bands of solar radiation?

    (A)   UV, infrared and far infrared

    (B)   Ultrasonic, infrared and visible

    (C)   UV, Visible and infrared

    (D)   UV, ultrasonic and near infrared

13. The direction of electric field in an LCD is determined by

    (A)   Quantum cellular automatic

    (B)   Crystalline surface structure

    (C)   Molecular orbital theory

    (D)   The molecular chemical structure

14. The change in refractive index of a material subjected to a steady magnetic field is called:

    (A)   Acoustic optic effect

    (B)   Extra optic effect

    (C)   Optical activity

    (D)   Magneto optic effect

15. The change in refractive index of a medium due to the presence of sound wave is called:

    (A)   Photo emissive effect

    (B)   Coulomb blockade effect

    (C)   Electro-optic effect

    (D)   Acousto optic effect

16. The cut off frequency of a MOSFET can be defined as:

    (A)   gm/2 π Cgs

    (B)   gm/2 π

    (C)   gm/gd

    (D)   gd/2 π Cgs

17. Transconductance of MOSFET in linear region can be approximated by:

    (A) $2\,k(V_{GS} - V_T)$

    (B) $k\,V_{DS}$

    (C) $I_D\,/\,(V_{GS} - V_{DS})$

    (D) $K(V_{GS} - V_T)^2\,/\,I_D$

18. The resonant frequency of an IMPATT diode is given by:

    (A) $V_d\,/2l$

    (B) $V_d\,/l$

    (C) $V_d\,/2\pi l$

    (D) $V_d\,/4\pi l$

19. The small signal model of a tunnel diode in negative resistance region is -

(A)

(B)

(C)

(D)
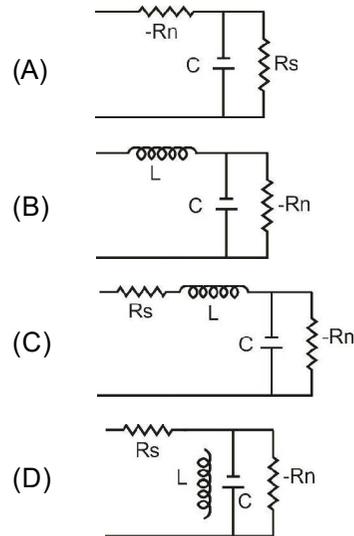
20. In a JFET, the maximum value of trans-conductance gm is:

(A) $\sqrt{\dfrac{I_{DSS}}{|V_p|}}$

(B) $\dfrac{2\,I_{DSS}}{|V_p|}$

(C) $\sqrt{\dfrac{2I_{DSS}}{|V_p|}}$

(D) $\dfrac{I_{DSS}}{|V_p|}$

Section - B

(Very Short Answer Type Questions)

(2 marks each)

Note: Attempt all questions from section C.

1. What is holding current in an SCR?

2. Define Diac.

3. What is IMPATT diode?

4. Define hetro - function?

5. What do you mean by JFET?

6. How Shockley diode is switched ON?

7. Define magneto-optic effect.

8. Explain numeric display.

Section - C

(Short Answer Type Questions)

(3 marks each)

Note: Attempt any 8 questions from section C.

1. Explain working of solar cell.

2. What is CCD?

3. Explain LCD.

4. Explain turn off mechanism of SCR.

5. Draw the diagram of MOSFET.

6. Define Radiative transitions.

7. What do you mean by acoustic - optic effects?

8. Explain transfer election device (TED).

9. Give working of Shockley diode.

Section - D

(Long Answer Type Questions)

(5 marks each)

Note: Attempt any four questions.

1. Discuss various triggering method of SCR.

2. Discuss the construction and working of solar cell.

3. What is LCD? Give its advantages and disadvantages and its applications.

4. Describe the principle, operation of IMPATT diode.

5. Explain working, principle and applications of MOSFET. Give suitable circuit diagram.