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Reg. No. :

Code No. : 6369

Sub. Code : HPHM 13

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2013.

First Semester

Physics

ELECTRONIC DEVICES

(For those who joined in July 2012 onwards)

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer:

1. If the reverse bias on the gate of a JFET is increased, then width of conducting channel
- (a) remains the same
 - (b) is increased
 - (c) is decreased
 - (d) none of the above.

2. A MOSFET can be operated with _____.

- (a) negative gate voltage only
- (b) positive gate voltage only
- (c) with positive and negative gate voltage
- (d) none of the above.

3. LED is generally constructed of

- (a) Ga As P
- (b) Ge
- (c) Si
- (d) none of the above

4. Laser light is considered to be coherent because it consists of

- (a) many wavelengths
- (b) uncoordinated wavelengths
- (c) coordinated waves of exactly the same wavelength
- (d) divergent waves.

5. Example of a volatile memory is

- (a) IC memory
- (b) magnetic tape
- (c) magnetic core
- (d) ROM.

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6. The power consumed by a TTL IC when compared with corresponding CMOS IC is
- more
 - less
 - equal
 - more or less depending on particular IC.
7. Liquid crystals are made mostly from
- organic materials
 - group IV semiconductors
 - inorganic materials
 - single crystals.
8. The main advantage of a polymer electrolyte stem from its remarkable
- transport properties
 - mechanical properties
 - optical properties
 - electrical properties
9. A diode which has zero break down voltage is known as
- | | |
|------------------|--------------------|
| (a) LED diode | (b) Zener diode |
| (c) tunnel diode | (d) backward diode |

10. In a semiconductor avalanche breakdown occurs when
- forward current exceeds the limiting value
 - forward bias exceeds the limiting value
 - reverse bias exceeds the limiting value
 - potential barrier is reduced to zero.

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) A JFET has a drain current of a 5 mA. If $I_{DSS} = 10 \text{ mA}$ and $V_{GS(off)} = -6 \text{ V}$, find the value of
- V_{GS} and
 - V_F .
- Or
- (b) An enhancement mode MOSFET has $V_{GS(TH)} = 3 \text{ V}$ and the specifications sheet shows $I_{D(on)} = 15 \text{ mA}$ at $V_{GS} = 10 \text{ V}$ find I_D for $V_{GS} = 5 \text{ V}$.
12. (a) Describe with the help of a relevant diagram the construction of an LED and explain its working.
- Or
- (b) Explain the principle, construction and working of a semiconductor laser.



13. (a) Compare SRAM with DRAM.

Or

- (b) Write a short note on CCD devices.

14. (a) Describe the principle and operation of an LCD.

Or

- (b) Give a brief account on surface acoustic wave devices.

15. (a) Compare and contrast of IMPATT diodes with BARITT diodes.

Or

- (b) List out the applications of tunnel diode and mention its advantages and disadvantages.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Discuss the I – V characteristics of Dual – Gate MOSFET and explain the application of a Dual – Gate MOSFET in an ACG amplifier.

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- (b) What are the different configurations of BJT? Explain the input and output characteristics of a transistor in CB configuration.

17. (a) A Cadmium sulphide ($E_g = 2.4$ eV) photodetector is illuminated with light of wavelength $3000 \text{ \AA}$. The intensity of radiation falling on the detector is 30 W/m^2 . The area of the detector is 9 mm^2 . Show that the electron – hole pairs will be generated by light. Assuming that each photon produces an electron – hole pair how many pairs will be generated per sec?

Or

- (b) The mirrors of a Fabry – Perot resonator for a laser are coated to give a reflectance of 0.99 and they are separated a distance of 1 m. Find the value of the fringe width in wavelength and the frequency at a wavelength of 633 nm.

18. (a) Explain the construction and working of CMOS and NMOS devices.

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- (b) Discuss the following in detail:
- (i) Magnetic memory
 - (ii) Optical memory
 - (iii) Ferro-electric memory.
19. (a) What are electro, magneto and acousto optic effects? Discuss the material properties related to get these effects.

Or

- (b) What are piezoelectric, electrostrictive and magnetostrictive effects? Discuss the important materials exhibiting these properties and their applications in sensors and actuator devices.
20. (a) What is tunneling? Draw the energy band diagram and from this diagram explain the V-I characteristics of a tunnel diode.

Or

- (b) Explain the principle and working of Gunn diode and list out its applications.
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