B.PRINTING ENGINEERING EXAMINATION, 2019

(2nd Year, 1st Semester)

Printing Material Science-I

Time:3hrs. **Full marks: 100**

(Attempt any one from (a) and (b) in Question-1.)

1. (a) (i) **Define** viscosity. What is the co-efficient of viscosity? **Express** it mathematically. (6)
   (ii) **Explain** the terms: **Laminar flow, turbulent flow** and **critical velocity.** How you will **determine** the **critical velocity**? (6)
   (iii) **State Bernoulli's theorem** for steady flow of an incompressible liquid and prove that sum of **velocity head, pressure head** and **elevation head** is constant. (8)

   (b) (i) What are meant by : **Surface tension, angle of contact**? What is the unit of surface tension. (6)
   (ii) **Distinguish** between **surface tension** and **capillarity.** (4)
   (iii) What is free **surface energy**? Find the relation between surface tension and free surface energy. (7)
   (iv) How does surface tension of a liquid **varies** with **temperature**? (3)

(Attempt any one from (a) and (b) in Question-2.)

2. (a) (i)**Define thermal Conductivity**. What is the **co-efficient of thermal conductivity? Ex[ress** it mathematically. (2+2+4=8)

   (ii)What is the **similarity** between **heat flow** and **electric flow**? (4)

   (iii)**Derive** an expression for the **rate of radial flow** of **heat** through a

hollow cylindrical surface whose inner and outer surfaces are maintained at **different temperature.** (8)

(b)(i)**Explain** with examples **various modes** of **transmission of heat.** (8)
(ii)State **STEFAN- BOLTZMANN's law** of heat radiation and **derive** the Law mathematically. (8)
(iii)What do you mean by **thermal resistance** and **thermal resistivity**? (4)

(Attempt any two from (a),(b),(c) and (d) from Question-3.)

3.(a)(i) How do you **classify optical fibres** in terms of modes of propagation. (5)
(ii)**Define fractional refractive index** and **numerical aperture** of an **optical fibre** . **Establish** the relation between them. (6)
(iii)Discuss about the **different usages** of optical fibres. (4)
(iv)What are the **advantages** of **optical fibre** over **normal conducting cables**? (5)

(b)(i) Write the names of the **different kinds** of **LASER.** What is **Ruby Laser,** Where it is **applicable**? (4+2)
(ii) **Discuss** the characteristics of laser radiation. (4)
(iii) How does **LASER** beam **differ** from **ordinary light?** (4)
(iv) What is **directionality** of **laser beam. Distinguish** between **spontaneous emission** and **simulated emission**? (2+4=6)

(c) (i) Explain the conduction in **N-type** and **P-type extrinsic semiconductors.** (4)
(ii) What are **intrinsic semiconductors**? How does **intrinsic semiconductor differ** from a **metal**? (4)
(iii) What is the effect of **increasing** in **temperature** on the **conductivity** of of **semiconductors?** (2)
(iv) What is a **super conductor**? Name **one super conducting** materials. Mention any two **applications.** (3)
(v) **Differentiate** between **insulators, conductors** and **semiconductors.** (4)
(vi) What is a **transistor**? What is the **main use** of **transistors**? (3)

(d) Write short notes on: (any two) (2X10)

(i) The different usages of OPTICAL FIBRES;
(ii) Application and uses of HOLOGRAPHY;
(iii) Band theory;
(iv) Ferromagnetic, Ferrimagnetic and Antiferromagnetic materials.

(Attempt any two from (a), (b) and (c) in Question-4.)

4.(a) Water is flowing in a capillary tube **40cm** iong and of **1mm internal radius** under a constant **pressure head of 15cm of water. Calculate the maximum velocity** of water in the tube and verify that the flow is streamlined.
Given for water viscosity **0.0098 poise**, Reynold's number=**1000 and g=9.8m/s².** (10)

(b) A cylinder of radius '**R'cm** is filled up to a height of '**h'cm**. Calculate the time it would take for **half the cylinder** to be emptied through a capillary tube of length '**l'cm** and **radius 'r'cm**. Given viscosity of the liquid is'**η**' poise and its density '**ρ'gm/cm³.** (10)

(c)(i) The thickness of ice on a lake is **5cm** and the temperature of air above is **-20°C.** Find the time taken for the thickness of ice to be doubled.
Given Density of **ice(ρ)=0.91gm/cm³** and **Laten heat of ice9L)= 80cal/gm;**
Thermal conductivity of ice(K)=0.005 cal/cm/sec/°C. (6)

(ii) A sphere of water of radius **1mm** is sprayed into a **million drops** all of the same size. **Find the energy expended** in doing so. Surface tension of water= **72dynes/cm**. (4)

****