

INDIAN RUBBER INSTITUTE
DIRI EXAMINATION – 2014

Paper - IV

Date: 12 July, 2014
Duration: 3.00 hours

Time : 14.00 - 17.00 hr
Full Marks: 100

Rubber Product Manufacturing and their Evaluation

Answer should be illustrated with sketches wherever needed.

Question No. 1 is compulsory. Answer other **Four questions** from the remaining taking **Two** from each group.

GROUP – A

1. Select the correct answer from the given alternatives :

- (i) In Mooney Viscometer, rotor speed is
(a) 2 Revolution / Min. (b) 100 Revolution / Min.
(c) 4 Revolution / Min. (d) 5⁰ Oscillation / Min.
- (ii) Corona resistance should be measured for :
(a) Tyre (b) V- Belt
(c) Hose (d) Cable
- (iii) The most suitable Elastomer for Tyre Curing Bladder :
(a) BR (b) IIR
(c) EPDM (d) Silicone
- (iv) The term Aspect Ratio is relevant for :
(a) V-Belt (b) Cable
(c) Tyre (d) Oil-seal
- (v) For latex product the preferred accelerator is :
(a) MBTS (b) ZDC
(c) DPG (d) TBBS

(vi) Insulator is a component of :

- (a) Hose
- (b) Cable
- (c) Tyre
- (d) V-Belt

(vii) Dry Bonding Agent is used to enhance :

- (a) Metal to Rubber Bonding
- (b) Metal to Plastic Bonding
- (c) Fabric to Rubber Bonding
- (d) Fabric to Plastic Bonding

(viii) Heat Build-up of Rubber compound can be measured by using :

- (a) Calorimeter
- (b) Goodrich Flexometer
- (c) De-mattia Flexometer
- (d) Ross Flexometer

(ix) Land and Sea these two terms are associated with the following product :

- (a) Conveyor Belt
- (b) Truck Tyre
- (c) Braided Hose
- (d) Rubber Boat

(x) For stabilization of latex, the useful material is :

- (a) CaCl_2
- (b) NH_3
- (c) CaCO_3
- (d) H_2SO_4

(xi) In a Braided Hose, if the braid angle is less than the neutral angle, the hose will :

- (a) Fatigue
- (b) Creep
- (c) Stress relaxation
- (d) Set

(xii) Hardness of Ebonite is measured in the Durometer scale of :

- (a) Increase in diameter
- (b) Increase in length
- (c) Elongate in the direction 45° to hoop force
- (d) No change during service

(xiii) The best curing system for metal-rubber bonding should be based on :

- (a) EV
- (b) Conventional
- (c) Peroxide
- (d) Semi EV

(xiv) Which of the following Operation is not associated with Tyre Manufacturing :

- (a) Extrusion
- (b) Braiding
- (c) Dipping
- (d) Calendering

(xv) High Styrene Resin is used in :

- (a) Conveyor Belt
- (b) Shoe Sole
- (c) Cable
- (d) Hose

(xvi) Peel Test is associated with

- (a) Electrical property
- (b) Adhesion property
- (c) Visco elastic property
- (d) Tensile property

(xvii) Armour is a component of

- (a) Truck Tyre
- (b) Cable
- (c) Hose
- (d) V-Belt

(xviii) Jacketless V-belt is superior to Jacketed V-belt in respect of :

- (a) Strength
- (b) Better dimensional stability
- (c) Wedging action
- (d) Lower diameter of pulley

(xix) The term LOI is related to :

- (a) Abrasion Resistance
- (b) Fire Resistance
- (c) Ozone Resistance
- (d) Compression set Resistance

(xx) Rotocuring is related to :

- (a) Tyre
- (b) V-belt
- (c) Cable
- (d) Foot wear

(1 x 20 = 20)

2. (a) Discuss the relative merits and demerits of radial ply & cross ply tyres. Explain with sketches their basic difference in carcass construction.

(b) What are the different types of cords/textile materials used in tyre construction ? Specify their application area with specific advantages.

(c) What is rolling resistance ? Why it is important ?

(d) Formulate a tread compound for passenger car tyre and justify briefly the selection of ingredients.

3. (a) What are the different components of a classical V-belt ? Showing a proper diagram, explain their individual functions.
- (b) What do you mean by hexagonal V-Belt and wedge type V-Belt. Why they are important ?
- (c) Write briefly the curing processes of V-belts.
- (d) What do you mean by life testing of V-belt ?

(6+5+6+3=20)

4. (a) Discuss the salient features and functions of the primary components of a hose.
- (b) Describe briefly the manufacturing steps for a braided hose.
- (c) What is neutral angle? How braiding angle is related to neutral angle and performance of the hose ?
- (d) Write a typical formulation of a cover compound for oil resistant hose.

(4+8+4+4 = 20)

GROUP – B

5. Answer the following with suitable reasons :

- (a) Why tensile strength measurement has been kept as a quality control test when very few rubber products fail by tension ?
- (b) Why it is necessary to heat stretch and set some type of fabric cords to be used in rubber products ?
- (c) What are the causes for the development of porosity in compression moulded products and how can they be eliminated ?
- (d) How house hold gloves are manufactured from latex, mentioning a typical recipe for it ?

(4+4+4+8 = 20)

6. (a) What is mean by dispersion Index of fillers ? Why it is important for Rubber Product manufacturing unit?
- (b) Write an inner-tube formulation having maximum heat resistance and air impermeability.
- (c) Explain the following terms of rubber properties

(i) Tear resistance
(iv) Creep

(ii) Head build-up
(v) Toughness

(iii) Stress relaxation

(5+5+5x2)= 20)

7. (a) Name a few important properties often used to check the quality of cured rubber and mention the instruments used to measure these properties.

(b) Write the full form of the followings :

- | | |
|-----------|------------|
| (i) ASTM | (vi) OCT |
| (ii) LOI | (vii) PCI |
| (iii) ISO | (viii) SMR |
| (iv) TBR | (ix) PVI |
| (v) PRI | (x) IRHD |

(10 + 10x1 = 20)

8. Write short notes on (**any four**) :

- | | |
|----------------------------|------------------------------------|
| (i) Rubber covered rollers | (ii) Continuous curing by rotocure |
| (iii) Hard rubber | (iv) Oil seal and gasket |
| (v) De-mattia flexometer | (vi) Tubeless tyres |

(5x 4 = 20)