

# INDIAN RUBBER INSTITUTE

## DIRI EXAMINATION – 2012

### Paper – IV

Date : 21<sup>st</sup> July, 2012

Duration : 3 Hours

Time : 14.00 – 17.00 hrs.

Full Marks : 100

### RUBBER PRODUCT MANUFACTURING AND THEIR EVALUATION

Answers should be illustrated with sketches wherever helpful.

**Question number 1** is compulsory. Answer **four** from the remaining questions taking **two** from **each group**.

#### GROUP – A

1. (a) Select the right answers from the given alternatives.
  - (i) Which is very specific operation in hose manufacturing?  
(a) Frictioning (b) Dipping (c) Splicing (d) Braiding
  - (ii) Which of the following operation is associated with conveyor belt manufacturing.  
(a) Calendering (b) Extrusion (c) Dipping (d) Braiding
  - (iii) Lug and Semi lug these two terms are associated with following products.  
(a) Rubber boat (b) Truck tyre (c) Mining Conveyor belt (d) Marine hose
  - (iv) NBR is blended with PVC to improve:  
(a) Tensile strength & tear strength (b) Ozone resistance & flame resistance  
(c) Heat resistance & oil resistance (d) Air impermeability & damping
  - (v) The most suitable cord for V-belt reinforcement is  
(a) Nylon (b) Rayon (c) Polyester (d) Cotton
  - (vi) Drum friction test is the test associated with  
(a) Conveyor belt (b) V-belts (c) Tyre (d) Cable
  - (vii) LPG (domestic gas) tubing should be made with  
(a) SBR (b) Butyl rubber (c) EPDM (d) Polychloroprene
  - (viii) SBR-1958 rubber may be used for  
(a) Aero tyre (b) Truck tyre (c) Cycle tyre (d) Shoe sole
  - (ix) To cure a thick rubber product one should use  
(a) Shorter time at low temperature (b) Shorter time at higher temperature  
(c) Longer time at elevated temperature (d) Longer time at lower temperature

- (x) 'H-pull' test is associated with  
 (a) Bonding of fabric to rubber (b) Hose  
 (c) Moulded rubber (d) Fabric abrasion

1 x 10 = 10

(b) State if the following statements are **TRUE** or **FALSE** and justify very briefly if requires.

- (i) NR abrasion resistance improves when blended with BR.  
 (ii) Dirt content of RMA-1 grade of natural rubber is higher than RMA-4 grade.  
 (iii) For tubeless tyre inner-liner should be made from BIIR.  
 (iv) Lug pattern is preferred in front wheel tyre.  
 (v) The term 'Rolling resistance' is associated with V-belt.

2 x 5 = 10

2. (a) Explain with diagram the constructional patterns of Bias tyre, Bias-Belted tyre and Radial tyre.  
 (b) Write a compound formulation for a truck tyre tread compound explaining the significance of each ingredient.  
 (c) Name the different parts of bead region of tyre with appropriate figure.

8 + 6 + 6 = 20

3. (a) What are the different components of a Hose and their specific functions?  
 (b) Describe one method for Hose curing?  
 (c) Describe briefly the manufacturing steps for V-belt.

8 + 4 + 8 = 20

4. (a) Match the following:

Property	Unit
a) Tensile strength	i) No. of cycles
b) Hardness	ii) $\Delta T(^{\circ}C)$
c) Tear strength	iii) $Kg/cm^2$
d) Heat buildup	iv) Shore A
e) Flex crack resistance	v) N/cm

- (b) Define the following terms  
 (i) Denier (ii) Tex (iii) Tenacity

- (c) Name at least one important test for following products.  
 (i) Tyre (ii) Hose (iii) V belt (iv) Oil seal (v) Condoms (vi) Shoe sole

5 + 6 + 9 = 20

**GROUP - B**

5. (a) What do you mean by Shore A & Shore D?  
(b) Explain  $ML_{1+4}@100^{\circ}C = 90$   
(c) Using tensile testing machine, what are the properties you can measure?  
(d) Draw standard curves you get from Mooney viscometer and Rheometer. **5 + 5 + 5 + 5 = 20**
6. (a) Name a few important properties often used to check the quality of cured rubber and mention instruments used to measure these properties.  
(b) Write the full form of the followings:
- (i) ISO
  - (ii) ASTM
  - (iii) LOI
  - (iv) BS
  - (v) PSi
  - (vi) kPa
  - (vii) MPa
  - (viii) %EB
  - (ix) O.C.T.
  - (x) Mod@300%
7. Name suitable rubber/blends/rubber like materials for following products, **10 + 10 = 20**
- (i) Inner tube of stem hose
  - (ii) Standard abrasive grade (A) cover compound for conveyor belt
  - (iii) Automotive tyre curing bag
  - (iv) Household cable insulation
  - (v) Vibration damper
  - (vi) Good quality V-belt jacket compound
  - (vii) Artificial hear valve
  - (viii) Cycle tyre
  - (ix) Hawaii sole
  - (x) Pressure sensitive adhesive
8. Write short notes on **(any four)** **10 x 2 = 20**
- (i) Metal rubber bonding.
  - (ii) Plunger testing of tyres.
  - (iii) Manufacturing of any latex product (brief).
  - (iv) Preparation of any microcellular product.
  - (v) Oil seal & gasket
  - (vi) Shoe sole & heel.

**5X4 = 20**