

**INDIAN RUBBER INSTITUTE  
DIRI EXAMINATION – 2022**

Paper – IV

Date : 26<sup>th</sup> March, 2023  
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

**Total FIVE questions are to be answered. Question number 1 is compulsory. Answer four from the remaining questions taking two from each group**

**GROUP – A**

1. Select the correct answer from the given alternatives:

- (i) The most widely used blowing agent for the production of Hawai sheets is  
(a) DNPT (b) Ammonium carbonate (c) Sodium nitrite (d) Ammonium chloride
- (ii) The term Aspect Ratio is relevant for :  
(a) V-Belt (b) Cable (c) Tyre (d) Oil seal
- (iii) The term “LOI” is related to  
(a) Ozone resistance (b) Fire Resistance (c) Abrasion resistance (d) Chemical Resistance
- (iv) For latex product the preferred accelerator is  
(a) DPG (b) TBBS (c) ZDC (d) MBTS
- (v) For a rubber compound,  $\tan \delta$  value gives an idea about  
(a) Heat build-up (b) Abrasion resistance (c) Tear strength (d) Tensile strength
- (vi) Silica and silane coupling agent are most important for  
(a) Green tyre technology (b) Footwear technology  
(c) Latex products (d) V-belt technology
- (vii) Heat treatment is necessary for  
(a) Rayon (b) Glass (c) Carbon fibre (d) Nylon
- (viii) Insulator is a component of  
(a) V-belt (b) Radial tyre (c) Cable (d) Hose
- (ix) For tubeless tyre, air is carried by  
(a) Tread base (b) Side wall (c) Breaker (d) Inner liner
- (x) Rotocuring is related to  
(a) Cable (b) V-belt (c) Tyre (d) Footwear
- (xi) Specific operation related to auto tube manufacturing is  
(a) Splicing (b) Braiding (c) Frictioning (d) Dipping

- (xii) Heat build up of a tyre compound is measured by  
 (a) De Mattia flexing machine (b) Goodrich flexometer  
 (c) Ross flexing machine (d) Fatigue to failure
- (xiii) 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
- (xiv) Holography is the test to evaluate:  
 (a) Shoe (b) Hose (c) V-belt (d) Tyre
- (xv) When a solid rubber ball is allowed to fall freely from a height of 10ft. and the ball bounce back to a height of 7ft. The resilience of the ball is .....  
 (a) 30% (b) 50% (c) 70% (d) 100%
- (xvi) Corona resistance should be measured for:  
 (a) Tyre (b) Hose (c) V-belt (d) Cable
- (xvii) The most popular cord for V-belt reinforcement is  
 (a) Nylon (b) Rayon (c) Polyester (d) Cotton
- (xviii) Endurance test is the test associate with  
 (a) Footwear (b) V-belts (c) Tyre (d) Cable
- (xix) In Mooney Viscometer, rotor speed is  
 (a) 2 Revolution / Min. (b) 100 Revolution / Min.  
 (c) 4 Revolution / Min. (d) 5 degree Oscillation / Min.
- (xx) Most important property of oil seal is  
 (a) Tensile strength (b) Tear strength (c) Compression set resistance (d) Resilience

(20 x 1 = 20)

2. (a) Write the neat cross section of a Conveyor Belt and explain the different components of a belt and their specific functions?  
 (b) What are the different types of Conveyor Belts commercially available in market.  
 (12+8)=20
3. (a) Discuss the 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) Give a typical formulation of a cover compound for oil resistant hose.  
 (4+10+3+3) = 20
4. (a) Mention the appropriate units of the following properties with examples.  
 (i) Flame Resistance (ii) Tear strength (iii) Torque in ODR (iv) Specific gravity  
 (v) Resistance (vi) Tensile strength (vii) Flex crack resistance (viii) Storage Modulus  
 (b) What is the purpose of Testing in Rubber Industry?  
 (c) What is meant by "Sample" and "Specimen?"  
 (8+6 +6)

**GROUP - B**

5. (a) Explain with neat diagram the construction patterns of Truck Bias tyre, and Radial tyre.  
(b) Explain the term : 175 / 70 R 15 6 PR in tyre  
(c) Name the different components of bead of a tyre. Illustrate with sketches.  
(d) Briefly explain the function of bead in a tyre.

(8+4+4+4)

6. (a) Name the processes and the product for which following equipments/instrument are required  
(i) Bag-o-Matic press (ii) Braider (iii) Rotocure (iv) Ball mill (v) Kneader  
(vi) Cross head extruder  
(b) State briefly, in a line or two, the significance of the following tests.  
(i) Iodine adsorption (ii) Ash content (iii) DBP (iv) Aniline point.

(6x2+4x2) = 20

7. (a) Calculate tensile strength, modulus at 100%, 200% & 300%, elongation and elongation at break for the given tensile test piece. The change in bench mark with applied load is given below, (sample thickness = 2 mm, width = 5mm, length = 40 mm)

Load (kg)	0	2.0	3.5	5.5	7.5	10.5	14.0	18	20	25	25.001
Bench mark (mm)	20	25	30	40	55	72	80	100	130	140	Failure

- (b) What is meant by accelerated ageing?  
(c) Describe accelerated ageing test in relation to tensile strength and elongation at break.

(10+4+6) = 20

8. Write short notes on (any four)  
(a) Dumbbell Specimen for Tensile Test  
(b) Tube Type Vs Tubeless Tyre  
(c) Shoe soles and heels with sketch  
(d) Drum friction test of conveyor belt  
(e) Oil seal & gasket  
(f) Rebound Resilience.

(4 x 5) = 20