

INDIAN RUBBER INSTITUTE

DIRI EXAMINATION – 2019

Paper – IV

Date : 7th July, 2019
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

- I. (a) Select the right answers from the given alternatives.
 - (i) Tensile strength measurement of rubber is classified as a Test.
(a) Mechanical (b) Thermal (c) Electrical (d) Thermal
 - (ii) Denier for a yarn is weight in gms for.
(a) 9000 m of yarn (b) 900 m of yarn (c) 90 m of yarn (d) 1000 m of yarn
 - (iii) Surgical gloves are made from latex process
(a) Dipping (b) Casting (c) Moulding (d) Extrusion
 - (iv) Reclaim rubber may be used for
(a) Aero tyre (b) Truck tyre (c) Cycle tyre (d) Passenger tyre tread
 - (v) Textile to rubber peel adhesion test is carried out at traverse speed of
(a) 100 mm/min (b) 200 mm/min (c) 300 mm/min (d) 400 mm/min
 - (vi) The most suitable cord for V-belt reinforcement is
(a) Nylon (b) Rayon (c) Polyester (d) Cotton
 - (vii) Which gelling agent is used for production of latex foam by Dunlop process?
(a) Acetic acid (b) Potassium oleate (c) Calcium chloride (d) Sodium silicofluoride
 - (viii) Corona resistance should be measured for:
(a) Tyre (b) Hose (c) V-belt (d) Cable
 - (ix) The term Aspect Ratio is relevant for :
(a) V-Belt (b) Cable (c) Tyre (d) Oil seal
 - (x) Hollography is the test to evaluate:
(a) Shoe (b) Hose (c) V-belt (d) Tyre
 - (xi) Flex cracking resistance of shoes soles is tested by:
(a) Goodrich flexometer (b) De Mattia flexometer
(c) Ross flexometer (d) Stress relaxometer

- (xii) Which properties does not relate to stiffness of the vulcanizate?
 (a) Young's modulus (b) M-300% (c) Hardness (d) Tensile strength
- (xiii) The best curing system for metal-rubber bonding should be based on:
 (a) EV (b) Conventional (c) peroxide (d) Semi-EV
- (xiv) 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
- (xv) NBR is blended with PVC to improve::
 (a) Tensile strength & tear strength (b) Heat resistance & oil resistance
 (c) Ozone resistance & flame resistance (d) Air impermeability and damping
- (xvi) Which is very specific operation in automotive tube manufacturing?
 (a) Frictioning (b) Dipping (c) Splicing (d) Braiding
- (xvii) Pneumatic tyre was invented by :
 (a) John Boyd Dunlop (b) Charles Goodyear
 (c) Thomas Hancock (d) Melvin Mooney
- (xviii) The property associate with the change of stress with time when rubber is held under constant strain is :
 (a) Fatigue (b) Creep (c) Stress relaxation (d) Set
- (xix) Hardness of Ebonite is measured in the Durometer scale of :
 (a) Shore A (b) Shore B (c) Shore C (d) Shore D
- (xx) The most suitable Elastomer for Tyre Curing Bladder :
 (a) BR (b) IIR (c) EPDM (d) CR

1 x 20 = 20

2. (a) Discuss the relative merits and demerits of radial and biased tyres.
 (b) Why PCI is important for production of Nylon reinforced tyres.
 (c) What are the important properties required for a truck tyre tread compound?
 (d) What are the different types of cords/textile materials used in tyre construction?
 Specify their application area with specific advantages

5 + 3+ 5+7 = 20

3. (a) What the different textile materials used in conveyor belt?
 (b) Briefly describe the manufacturing of process for conveyor belt?
 (c) Suggest base polymer/polymer blends for conveyor belt cover compound of the following grades and justify your answers.
 (i) Super heat resistance (ii) Flame and fire resistance (iii) M-24
 (d) Mention at least four important tests for conveyor belt.
 (e) Write a brief note on RFL dipping of a polymeric fabric.

2 + 6 + 6+2+4 = 20

4. (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) Mention the appropriate units of the following properties
 (i) Volume resistivity, (ii) Tear strength, (iii) Tensile modulus (iv) Density of textile yarn
 (d) Explain the following terms of rubber properties
 (i) Stiffness (ii) Creep (iii) Heat build-up (iv) Tear resistance
- 4 +4+4+ 8 =20**

GROUP – B

5. (a) Write briefly how the Rebound Resilience and Heat build-up of rubber compounds are measured.
 (b) Name suitable rubber/blends/rubber like materials for the following products,
 (i) Inner tube of stem hose, (ii) Automotive tyre curing bag, (iii) Household cable insulation, (iv) Cycle tyre, (v) Hawaii sole, (iv) LPG (domestic gas) tube
- 8 +6 x 2 = 20**
6. (a) Discuss the important of “conditioning” of test pieces while testing.
 (b) Mention important processing care to be taken during calendaring and extrusion process.
 (c) Name a few important properties often used to cheek the quality of rubber vulcanizate and mention instruments used to measure these properties.
 (d) Write the full form of the followings:
 (i) ISO, (ii) ASTM, (iii) PRI, (iv) ISAF, (v) DRC, (vi) SMR, (vii) IRHD, (viii) RMA
- 4x3 + 8 = 20**
7. (a) What is meant by Abrasion Resistance Index?
 (b) Write briefly how the Abrasion Resistance of Rubber compound is measured.
 (c) How the values of Abrasion Resistance of Tyre tread compounds correlate the Mileage of Tyres?.
 (d) What do you mean by Shore A and Shore D?
 (e) Explain $ML_{1+4} @ 100^{\circ}C = 90$.
- 3+6+4 +3+4 = 20**
8. Write short notes on (any four)
- (i) Hardness testing of rubber and rubber-like materials
 - (ii) Swelling resistance.
 - (iii) Goodrich Flexometer
 - (iv) Shoe sole & heel
 - (v) Classical V-belt
 - (vi) Accelerated ageing test.
- 4 x 5 = 20**

