

**INDIAN RUBBER INSTITUTE
PGDIRI EXAMINATION – 2018**

Paper – IV

**Date : 15th July, 2018
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.(a) Multiple choice questions: select the correct answers from the given alternatives:

- (i) Troughability test is relevant to
(a) Tyre (b) Hose (c) Conveyor belt (d) V-belt
- (ii) Cycle tyre cord is mainly derived from
(a) Cotton (b) Nylon (c) Rayon (d) Polyester
- (iii) For coagulation of latex the useful materials is
(a) Acetic acid (b) Silica (c) Ammonia (d) Calcium carbonate
- (iv) Which curing system gives maximum flex properties?
(a) Peroxide (b) Semi efficient cure (c) Conventional cure (d) Efficient cure
- (v) Hardness of ebonite is measured in the durometer scale of
(a) Shore A (b) Shore B (c) Shore D (d) Shore C
- (vi) The neutral angle associates with hose design is
(a) 55°44' (b) 44°54' (c) 54°44' (d) 44°55'
- (vii) Unit of flex cracking resistance
(a) Kg/cm² (b) No. of cycle (c) Kg/cm (d) Kg/cm
- (viii) Angle of steel cords in the belt of a radial tyre
(a) 12° - 18° (b) 35° - 40° (c) 25° - 30° (d) 85° - 90°
- (ix) Best curing system for metal-rubber bonding should be based on:
(a) Semi efficient (b) Peroxide (c) Conventional (d) Efficient
- (x) Holography is an important test for
(a) Hose (b) V-belt (c) Conveyor belt (d) Tyre
- (xi) The term "Last" is related to
(a) Latex dipped products (b) Injection moulded products
(c) Hot water bottle (d) Footwear

- (xii) Air craft tyre is based on
 (a) NR-SBR blend (b) NR-BR blend (c) Neat NR (d) SBR-BR blend
- (xiii) Tyre side walls are made thin because
 (a) For better heat dissipation due to high dynamic flexing (c) For better economy
 (b) As no abrasion resistance is needed for side walls (d) Lower road grip
- (xiv) Why iron is not selected as cable conductor because it has
 (a) Poor fatigue resistance (c) Poor electrical conductivity
 (b) It gets rusted easily (d) Poor thermal conductivity
- (xv) For semi-conducting component in high voltage cable which filler should be used
 (a) Cancined clay (b) Cacium carbonate (c) Carbon black (d) Silica

- 1.(b) State if the following statement are TRUE or FALSE, if false correct those
- Direct content of RMA-1 grade of natural rubber is less than RMA-4 grade.
 - SRB generally gives better abrasion resistance than NR.
 - Sulfur and accelerator should be added first to natural rubber during compounding.
 - The term 'Run-Flat' is associated with conveyor belt.
 - 'Rolling resistance' term is associated with cable.

(1 x 20) = 20

2. (a) Explain with diagram the different types of constructional pattern of Bias tyre, Bias-Belted tyre and radial tyre.
 (b) Write a compound formulation for a truck tyre tread mentioning the function of each ingredient used.
 (c) Briefly explain the construction and function of a bead in a tyre
 (d) How automobile inner tube is manufactured now-a-days?
 What is the of basis selection of polymer for this product?

(7+5+4+4) = 20

3. (a) Sketch the different components of a cable.
 (b) Write a typical formula for high quality heat resistant cable cover compound. Explain the reasons for the choice of ingredient?
 (c) Define dielectric constant & loss factor and name some instruments where these tow parameters can be measured?
 (d) Formulate a typical flame resistance jacket compound for cable and justify your formulation?

5 x 4 = 20

4. (a) What is V-belt? Where it is used?
 (b) Describe the basic construction of classical V-belt with diagram and explain the function of each component.
 (c) What type of rubber is to be used in base, cushion and jacket compound.
 (d) Briefly describe the manufacturing process with flow chart for classical V-belt?

(3+6+3+8) = 20

GROUP – B

6. (a) Name a few important processing equipment used in the rubber industry. Mention the process for which they are used.
 (b) Name a few important testing equipment you have seen in your industry. Mention the tests for which these equipment are used..
 (c) Name 6 standard properties to determine the quality of a rubber products.

(8+6+6) = 20

5. (a) What is the significance of Swelling Test? Mention two areas of application where swelling test is important.
- (b) Immersion of a vulcanized rubber sample in petrol (specific gravity = 0.9) caused its weight to increase from 5.0 to 7.43 gm. and its weight when fully immersed in water to decrease from 1.91 gm to 1.17 gm. Calculate the percentage change in volume of the vulcanizate caused by immersion.
- (c) Draw a standard curve for Mooney viscometer and Rheometer. Explain those graphs.

(4+8+8) = 20

7. (a) Discuss different functional requirements of conveyor belt?
- (b) In conveyor belt terminology, what do you mean by M-24, N-17, EP and PP?
- (c) Discuss on Drum friction test for Conveyor belt?
- (d) Discuss the selection of base rubber/blends for conveyor belt compound with special reference to the following applications and justify your answer
- a) Flame and fire resistant, b) Conveyor belt for coal mine c) Super heat resistance.

(6+6+4+4) = 20

8. Write short notes on (any four)
- (a) Curing of cable.
- (b) Meta surface preparation for binding with rubber.
- (c) Effect of curing system on flexing, compression and ageing properties.
- (d) Surface area of carbon black.
- (e) Preparation of hand gloves from latex.
- (f) Conventional and efficient vulcanization.

(4 x 5) = 20