INDIAN RUBBER INSTITUTE

DIRI EXAMINATION – 2015

Paper-IV

Date: 18th July, 2015 **Time: 14.00-17.00 hrs.**

Duration: 3 Hours **Full Marks : 100**

Rubber Product Manufacturing and their Evaluation

Answers should be illustrated with sketches wherever helpful

Total **FIVE** questions are to be answered. From **"Group-A"** answer **three** questions out of which **Question No. 1** is compulsory and from **"Group-B"** answer **two** questions only.

GROUP – A

1. Select the correct answers from the given alternatives :

(i) Which of the following operation is associated with conveyor belt manufacturing ?
(a) Calendering, (b) Extrusion, (c) Braiding, (d) Transfer moulding

(ii) The rate of flexing in De Mattia flexing machine is ..... Cycles per minute.
(a) 400, (b) 300, (c) 200, (d) 100

(iii) LPG (domestic gas) should be made of
(a) SBR, (b) IIR, (c) CR, (d) EPDM

(iv) Mooney scorch time is the time required for the torque to rise ..... units above the minimum.
(a) 2, (b) 5, (c) 10, (d) 15

(v) Which rubber is most suitable for making hot water bottle ?
(a) EPDM, (b) IIR, (c) Silicone, (d) NR

(vi) Angle of steel cords in a belt of a radial tyre is
(a) $12^{o} - 18^{o}$, (b) $25^{o} - 30^{o}$, (c) $35^{o} - 40^{o}$, (d) $85^{o} - 90^{o}$

(vii) The term Aspect Ratio is relevant for
(a) Conveyor belt, (b) Cable, (c) Tyre, (d) Hose

(viii) Textile to rubber peel adhesion test is carried out at a traverse speed of
(a) 100 mm/min. (b) 200 mm/min. (c) 300 mm/min. (d) 400 mm/min.

(ix) The maximum dimensional stability is shown by a conveyor belt reinforced with
(a) Rayon, (b) Nylon, (c) Polyester, (d) Steel cord

(x) Included angle in a V-belt and braiding angle in a braided hose should be respectively
(a) 30^{o} and 44^{o}, (b) $40^{o}$and 54^{o}, (c) 50^{o} and 64^{o}, (d) $60^{o}$and 74^{o}

[Turn Over]

(xi) 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

(xii) In crescent tear test the result is expressed as
(a) Tearing load/ thickness of sample
(b) Tearing load/ original cross-sectional area of sample
(c) Tearing load/ width of sample
(d) Tearing load only

(xiii) Which elastomer is suitable for manufacturing pressure sensitive contact adhesive?
(a) BR, (b) SBR, (c) CR, (d) NBR

(xiv) Which property does not relate to stiffness of the vulcanizate ?
(a) Young's modulus, (b) M-300%, (c) Hardness, (d) Tensile strength

(xv) Which element in a tyre restricts deformation of the carcass plies and provides added stiffness to the tread ?
(a) Bead, (b) Belt, (c) Inner liner, (d) Chafer

(xvi) Which is the most important property for oil seals and gaskets ?
(a) Tear strength, (b) Tensile strength, (c) Compression set, (d) Modulus

(xvii) Which process is followed for manufacturing of surgical gloves from latex ?
(a) Moulding, (b) Dipping, (c) Casting, (d) Calendering

(xviii) 'H-pull' test is associated with
(a) Bonding of textile cord to rubber, (b) Moulded rubber, (c) Hose, (d) Fabric abrasion

(xix) Bag-O-Matic press is largely used for curing of
(a) V-belt, (b) Transmission belt, (c) Metalastik, (d) Tyre

(xx) Heat build up of a tyre compound is measured by
(a) De Mattia flexing machine, (b) Goodrich flexometer, (c) Ross flexing machine, e) Fatigue to failure tester

1x20 = 20

2.(a) What are the carcass construction used in radial and biased tyres ? Illustrate with sketches.
(b) Discuss relative merits and demerits of radial and biased tyres.
(c) Why PCI is important for production of nylon reinforced tyres ?
(d) What are the important properties required for a truck tyre tread compound ?
(e) Why holography test is important in tyres ?

6 + 5 + 3 + 4 + 2 = 20

3.(a) What are the different textile materials used in conveyor belt ?
(b) Write a brief note on RFL dipping of a polymeric fabric.
(c) Briefly describe the manufacturing process for conveyor belt.

[Turn Over]

(d) Suggest base polymer/ polymer blends for conveyor belt cover compound of following grades and justify your answers.
(i) Super heat resistance, (ii) Flame and fire resistance and (iii) M-24

(e) Mention at least four important tests for conveyor belt.

2+ 4 + 6 + 6 + 2 = 20

4.(a) Define KOH number in NR latex. State its significance.

(b) What are the basic principles for preparation of latex compound ?

(c) Mention at least four latex products.

(d) Describe briefly the manufacturing process of any one latex product t hat you have mentioned.

4 + 6 + 4 + 6 = 20

GROUP – B

5.(a) The terms modulus, stress-relaxation, cut growth, flex cracking and abrasion resistance are used in physical testing of rubber. State briefly what is meant by each of them.

(b) Expand the following abbreviations as applied in rubber technology.
ANSI, LOI, PRI, BIS, ISAF,
VGC, VFA, HNBR, OTR, FMQ

10 + 10 = 20

6.(a) What do you understand by rebound resilience of rubber ?

(b) The striker of Dunlop tripsometer is dropped from an angle of 45° and after impact with the rubber specimen returned through an angle of 30°. Calculate the rebound resilience of rubber.
(Values of cos 45° and cos 30° are 0.866 and 0.707 respectively)

(c) What is meant by Abrasion Resistance Index ?

(d) Describe briefly a method to determine the abrasion loss of a rubber vulcanisate.

4 + 6 + 4 + 6 = 20

7.(a) State briefly, in a line or two, the significance of the following chemical tests.
(i) Aniline point, (ii) Ash content, (iii) pH, (iv) Acid value and (v) Iodine adsorption.

(b) Mention the appropriate units of the following properties.

(i) M-300%	(ii) Specific gravity
(iii) Density of textile yarn	(iv) Surface area of carbon black
(v) Volume resistivity	(vi) Power
(vii) Tear strength	(viii) Mechanical stability of latex
(ix) Torque in ODR	(x) Fatigue life

(5x2) + 10 = 20

8. Write short notes on any **four** of the following.

(a) Electrical properties of cable

(b) Derivation of neutral angle in a braided hose

(c) Concentration of NR latex

(d) Accelerated ageing test

(e) Standard and specification

(f) Classical V-belt

(g) Production process of either ply or braided hose

4x5 = 20