INDIAN RUBBER INSTITUTE
PGD-IRI EXAMINATION – 2014

Paper - III

Date: 12 July, 2014 **Time: 10.00 - 13.00 hrs**
Duration: 3 hours **Full Marks: 100**

RUBBER MATERIALS

Answer should be illustrated with sketches wherever helpful

Total Five questions are to be answered. Each question carries 20 marks.

Question No. 1 is compulsory. Answer **Four questions** from the remaining taking **Two** from each group.

GROUP – A

1. (a) Multiple choice questions. Select the correct answer from the given alternatives:

(i) To improve the conductivity of the compound which carbon black is preferred.

(a) SAF (b) ISAF
(c) GPF (d) HAF

(ii) XLPE cable requires a conductive layer over the conductor and over the insulation. Which polymer is recommended for the above applications?

(a) CR (b) NBR
(c) EVA (d) EPDM

(iii) Reclaim rubber may be used for.

(a) Passenger tyre tread (b) Conveyor belt – cover compound
(c) Cycle tyre tread (d) Truck tyre tread

(iv) Which polymer has got highest heat resistance property.

(a) SBR (b) NBR
(c) EPDM (d) FPM

(v) Oil content of SBR 1712 is.

(a) 18.5% (b) 50%
(c) 37.5% (d) None

(vi) What is the basis for grading of ISNR.

(a) Dirt content
(b) Viscosity
(b) Ash content
(d) Nitrogen content

(vii) A 100% hydrogenated NBR can be vulcanized by.

(a) Sulphur and accelerator
(b) Peroxides
(c) Metal oxides
(d) None of these

(viii) Which rubber has the widest temperature range of application.

(a) EPDM
(b) NR
(c) Butyl
(d) Silicone
(e) Polybutadiene (BR)

(ix) Increasing the acrylonitrile content the property which decrease is.

(a) Oil resistance
(b) Heat resistance
(c) Resilience
(d) Tg

(x) Peroxide curing is not suitable for

(a) IIR
(b) NBR
(c) BR
(d) SBR
(e) NR

(xi) Name the rubber which has better or equal air impermeability than butyl rubber.

(a) Chlorosulponated polyethylene
(b) Acrylic rubber
(c) Expoxidised NR
(d) Polyepichlorohydrin
(e) None of the above

(xii) In latex compounding the chemical used as gelling agent is

(a) Resorcinol
(b) Sodium Silicofluoride
(c) ZnO
(d) Ammonia

(xiii) Select a cure system for best flexlife of cured product.

(a) Conventional
(b) Peroxide
(c) EV
(d) Semi EV

(xiv) Calcium oxide is used in EPDM microwave curing for.

(a) Better shine on finished product (b) Uniform dispersion of reinforcing materials
(c) Absorbing moisture (d) Fast extrusion

(xv) PF resin curing is the most suitable for.

(a) BR (b) NBR
(c) IIR (d) NR

1 x 15 = 15

(b) Mention the function of the following compounding ingredients in rubber.

(i) Aluminium trihydrate
(ii) Benzoic acid
(iii) Para quinine dioxime
(iv) Precipitated silica
(v) Octylated diphenylamine

1 x 5 = 5

2. (a) Describe briefly the manufacturing process of butyl rubber.
   (b) What are the limitations of butyl rubber.
   (c) What are the advantages of PF resin cure of butyl rubber. Name one product where such system is preferred.
   (d) Which type of butyl rubber is compatible with NR and why?
   (e) What is the advantage of using butyl tube in car or truck tyres?

8+3+3+3+3 = 20

3. Write short notes on **any Four.**
   (i) Mastication of natural rubber.
   (ii) Insoluble sulphur
   (iii) Mineral oil
   (iv) Sulphenamide accelerators
   (v) Flurocarbon rubbers
   (vi) Comparison of Nylon 6 and Nylon 66

4 x 5 = 20

4. (a) Discuss the manufacturing of furnace black with flow chart.

(b) What is the function of a filler.

(c) Which properties can be achieved by using small particle size carbon black.

(d) Explain ASTM classification of N110.

(e) What is coupling agent? Why and when it is used.

8+4+3+2+3 = 20

GROUP – B

5. (a) Write down SI units with symbol of the following properties.

(i) Tensile strength
(ii) Force
(iii) Tear strength
(iv) Adhesive strength
(v) Pressure

5 x 1 = 5

(b) What type of curing agent is recommended for the following rubbers/blend.

(i) Fluorocarbon rubber
(ii) EPM rubber
(iii) EVA
(iv) Bromobutyl rubber
(v) 70/30 NBR/PVC blend

5 x 1 = 5

(c) Describe briefly heat treatment process of Nylon. 6

(d) What is the procedure for bonding polyester fabric with rubber. 4

6. (a) Name the type of accelerator and vulcanizing agents used in curing the following rubber products:

(i) Cycle tyre tread compound.
(ii) Butyl based cycle tube.
(iii) NR based truck tread base compound.
(iv) NR based conveyor cover compound.
(v) Polychloroprene based LGP tube
(vi) Silicone based oil seals.
(vii) EVA based conductive layer of XLPE cable.
(viii) Hot water bottle.
(ix) Polychloroprene based bridge bearing pad.

(x) General purpose EPDM insulation for heat resistance cables.

1 x 10 = 10

(b) Give one / two examples of each of the following.

(i) Retarders
(ii) Processing Oil
(iii)Blowing agents
(iv)Peptizers
(v) Antioxidants

1 x 5 = 5

(c) Give one applications of each of the following blends.

(i) NBR/PVC
(ii) Bromobutyl / NR
(iii)PE / EVA
(iv)PP / EPDM
(v) NR / Reclaim

1 x 5 = 5

7. (a) Compare and Contrast NBR & CR. What grade of CR is used for stuck on process adhesive for shoe.

8+2 = 10

(b) Describe the method of manufacturing whole tyre reclaim. List down different reclaims available for compounding. How are reclaims graded.

5+3+2=10

8. (a) Describe briefly the process of manufacture to technically specified rubber (known as crumb rubber).

(b) What are the advantages of technically specified rubber over conventional sheet rubber.

(c) Explain the significance of plasticity retention index of natural rubber.

10+5+5=20