INDIAN RUBBER INSTITUTE
PGDIRI EXAMINATION – 2022

Paper – IV

Date : 26ᵗʰ March, 2023   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. **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)   Drum friction test is relevant to
        (a) Tyre   (b) V-belt   (c) Hose   (d) Conveyor belt

(ii)   Rubber prefer for Aero tyre
        (a) SBR   (b) NR   (c) BR   (d) EPDM

(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) $55^0 44'$ (b) $44^0 54'$ (c) $54^0 44'$ (d) $44^0 55'$

(vii)   Unit of flex cracking resistance
        (a) Kg/cm^2 (b) No. of cycle   (d) Kg-cm   (c) Kg/cm

(viii) Angle of steel cords in the belt of a radial tyre
        (a) $12^0 - 18^0$ (b) $35^0 - 40^0$ (d) $85^0 - 90^0$ (c) $25^0 - 30^0$

(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)   Endurance test is the test associate with
        (a) Footwear   (b) Tyre   (c) V-belts   (d) Cable

(xiii) Air craft tyre is based on
        (a) NR-SBR blend   (b) NR-BR blend   (c) Neat NR   (d) SBR-BR blend

(xiv) Aspect ratio of modern passenger car tyre is about
        (a) 30%   (b) 70%   (c) 100%   (d) 120%

(xv)   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

(xvi) For semi-conducting component in high voltage cable which filler should be used
        (a) Cancined clay   (b) Cacium carbonate   (c) Carbon black   (d) Silica

(xvii) If a solid rubber ball is freely falling from a height "X", bounce back to a height "Y", then the resilience of the ball can be estimated from,
        (a) $(1- \cos X)/(1-\cos Y)$ (b) $1+X/1-Y$ (c) Y/X (d) X/Y

(xviii) Skid resistance is a term related to
        (a) V-belt   (b) Conveyor belt   (c) Tyre   (d) Hose

(xix) The tern "Run-Flat" is associated with:
        (a) Conveyor Belts   (b) V-belt   (c) Tyre   (d) Hose

(xx)   Property associated with change of strain with time when subjected under constant stress is
        (a) Set   (b) Creep   (c) Fatigue   (d) Stress relaxation

$$(1 \times 20) = 20$$

2. (a) Write the advantages of Radial tyre over Bias tyre?
    (b) Sketch Lug and Rib design of tyre tread pattern. Also mention their fitment position in a vehicle.
    (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?

$$(5x4) = 20$$

3. (a) Name 4 important latex products
    (b) Describe briefly the manufacturing process (flow chart) for any one of the latex Products you mentioned.
    (c) What is DRC and TSC of Latex and how it is determined?

$$(4 +8+8)=20$$

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

5. (a) What is moulded hose?
   (b) Describe briefly the manufacturing steps for braided hose.
   (c) What is neutral angle of braided hose? Derive with neat sketch
   (d) How braiding angle is related to performance of the hose?

$$(2+ 8+8+2)=20$$

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.

$$(8+6+6) = 20$$

7. (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.

$$(4+8+8) = 20$$

8. Write short notes on (any four)
   (a) Manufacturing techniques of Foam
   (b) Meta surface preparation for binding with rubber.
   (c) Effect of curing system on flexing, compression and ageing properties.
   (d) Manufacture of Microcellular sheet
   (e) Preparation of hand gloves from latex.
   (f) Conventional and efficient vulcanization.

$$(4 \times 5) = 20$$