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** question to be answered. Each question carry 20 marks.

Part A: Question no. 1 is compulsory and any two. from the remaining

Part B: Minimum any 2 nos. to be answered.

GROUP A

(a) Select the right answers from the given alternatives.

(i) Which is very specific operation in automotive tube manufacturing?

(a) Frictioning   (b) Dipping   (c) Splicing   (d) Braiding

(ii) Which of the following operation is not associated with tyre manufacturing.

(a) Calendering   (b) Extrusion   (c) Dipping   (d) Braiding

(iii) Land and Sea these two terms are associated with following products.

(a) Rubber boat   (b) Truck tyre   (c) Mining Conveyor belt   (d) Marine hose

(iv) EPDM rubber is blended with Butyl rubber for tube compound to improve:

(a) Tensile strength   (b) Ozone resistance

(c) Heat resistance   (d) Air impermeability

(v) The most suitable cord for V-belt reinforcement is

(a) Nylon   (b) Rayon   (c) Polyester   (d) Cotton

(vi) Endurance test is the test associated with

(a) Footwear   (b) V-belts   (c) Tyre   (d) Cable

(vii) LPG (domestic gas) tubing should be made with

(a) SBR   (b) Butyl rubber   (c) EPDM   (d) Polychloroprene

(viii) Reclaim rubber may be used for

(a) Aerotyre   (b) Truck tyre   (c) Cycle tyre   (d) Passenger tyre tread

(ix) To cure a thick rubber product one should use

(a) Shorter time at low temperature   (b) Shorter time at higher temperature

(c) Longer time at elevated temperature   (d) Longer time at lower temperature

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(x) 'Peel' test is associated with

    (a) Bond testing of fabric to rubber   (b) Hose

    (c) Moulded rubber   (d) Fabric abrasion

$1 \times 10 = 10$

1.(b) State if the following statements are TRUE or FALSE, if false correct those.

(i) RFL treatment of cord is done to improve bonding with rubber.

(ii) For normal NR compound mixing in open mill the temperature maintain at 75-80^{0}C.

(iii) Abrasion resistance improves when polybutadiene is blended with natural rubber.

(iv) Dirt content of RMA-1 grade of natural rubber is less than RMA-4 grade.

(v) For tubeless tyre air is retained by side wall.

(vi) Sulfur and accelerator should be added first to natural rubber during compounding.

(vii) SBR generally gives better abrasion resistance than NR

(viii) Lug pattern is preferred in back wheel tyre.

(ix) 'Rolling resistance' the term is associated with V-belt.

(x) SMR represents accelerator.

$1 \times 10 = 10$

2.(a) Explain with diagram the constructional patterns of Bias tyre, Bias-Belted tyre and Radial tyre.

(b) Write a compound formulation for a truck tyre tread compound explaining the significance of each ingredient.

(c) Name the different parts of bead region of tyre, with appropriate figure.

$8 + 6 + 6 = 20$

3.(a) What are the different components of a V-belt and their specific functions?

(b) Describe one method for V-belt curing?

(c) Describe briefly the manufacturing steps for braided hose.

$8 + 4 + 8 = 20$

4. The following carbon black filled natural rubber based compound is mixed in an internal mixer.

Ingredients	Parts by weight	Sp. Gravity
Natural Rubber	100	0.92
Zinc Oxide	5	5.50
Stearic Acid	2	0.85
HAF Black	60	1.80
Ppt. Silica	20	2.00
Process Oil	8	0.97
6PPD	1.5	1.10
CBS	1,0	1.30
Sulfur	2.0	2.00

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(a) Calculate the Sp. Gravity of the compound?

(b) If cost per kg. of the compound is Rs.70/-, Calculate the cost per unit volume.

(c) What are the function of 6PPD & CBS, Zinc oxide and Stearic acid in above formation?

$7 + 5 + 8 = 20$

PART – B

5. (a) Explain why testing of a rubber product is important.

(b) Name 6 standard properties to determine the quality of a rubber products.

(c) Discuss on Drum friction test for Conveyor belt & life test for V belt.

$6 + 6 + 8 = 20$

6. (a) What is the purpose of using a Mooney viscometer and Rheometer?

(b) What are the test you can perform on a Mooney plastometer and Rheometer?

(c) Draw a standard curve for Mooney viscometer & a Rheometer,& explain.

(d) What is the normal temperature used in a Mooney plastometer and Rheometer?

$4 + 4 + 8 + 4 = 20$

7. (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 tests for which these equipment are used.

(c) Mention important processing care to be taken during calendaring and extrusion process.

$8 + 6 + 6 = 20$

8. Write short notes on (**any five**)

(i) Fabric to rubber adhesion tests.

(ii) Tensile & Tear test for rubber vulcanizate

(iii) Plunger testing of tyre.

(iv) Hardness testing of rubber.

(v) Non-destructive tests of tyre.

(vi) Ageing test of a vulcanized rubber.

$5 \times 4 = 20$