Corrected

INDIAN RUBBER INSTITUTE
DIRI EXAMINATION – 2018

Paper – II

Date : 14th July, 2018 **Time : 14.00 – 17.00 hrs.**
Duration : 3 Hours **Full Marks : 100**

Rubber Processing Technology & Process Engineering

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. Multiple choice questions: Select the correct answer from the given alternatives:

(i) The unit of pressure is
(a) Newton (b) Pascal (c) Joule (d) Watt

(ii) Screw mark is associated with:
(a) Calendering (b) Open steam cure (c) Extrusion (d) Press moulding

(iii) Blooming on the rubber surface occurs, when
(a) Mixing of the ingredients in rubber is inhomogeneous
(b) Rubber has low tack property
(c) Migration of excess solid particles due to incompatibility
(d) None of the above

(iv) A common and often overlooked cause of poor dispersion is
(a) Specific gravity of stock is too low (b) Batch size too large
(c) Dump temperature too low (d) None of the above

(v) Wallace Rapid Plasticity Number illustrates about:
(a) Scorch time (b) Cure time
(c) Addition of chemicals (d) Sagging of rubber & lack of adhesion to rolls

(vi) The mold temperature in an injection moulding machine is;
(a) Higher than injection temperature, (c) Lower than injection temperature
(b) Equal to injection temperature (d) None of the above

(vii) For better dispersion in a two roll mill mixing:
(a) Bank size should be large (b) Bank size should be small
(c) Roll cooling should be enough
(d) Bank size should be such that materials rolls constantly at the nip

(viii) On crosslinking the rubber becomes
(a) Soluble in organic solvents (b) Insoluble in organic solvents
(c) Partially soluble in organic solvents (d) None of the above.

(ix) Scorching of rubber compounds takes place due to:
(a) Excessive oil dosage (b) Slow curing accelerators
(c) Excessive processing temperature (d) Improper black dispersion

(x) The pH of NR latex as obtained from the tree is
(a) 5.5 (b) 6.5 (c) 7.5 (d) 8.5

(xi) In a cold feed extruder, the extrudate temperature increases as
(a) The screw temperature increases (c) The screw speed increases
(b) The Mooney viscosity of the compound decreases (d) None of the above

(xii) Both the sides coating of a fabric can be simultaneously done by using
(a) Z-type 4 roll calendar (b) Inverted 'L' type 3 roll calendar
(b) L type 3 roll calendar (c) None of the above

(xiii) "Back Pressure" is the terminology used in
(a) RIM (b) Extrusion process (c) Compression molding (d) None of the above

(xiv) After the moulding the O-ring dimensions will measure
(a) Lesser than mould dimension (b) Higher than mould dimension
(c) Equal to mould dimension (d) No effect

(xv) To test the Mooney viscosity of NR compound at 100°C the pre-heat time required is
(a) Four minutes (b) Three minutes (c) Two minutes (d) One minute

(xvi) Mastication will be favoured in the presence of:
(a) Peptizers (b) Antioxidants (c) Antiozonant (d) None of the above

(xvii) Mooney Viscometer is the most effective test for predicting the behavior rubber compounds during:
(a) Casting (b) Reaction injection moulding
(c) Compression moulding (d) Injection moulding

(xviii) In a hydraulic curing _____ process needs to be done to remove entrapped air of a rubber product
(a) Frictioning (b) Prickling (c) Awling (d) Bumping

(xix) Time t_2 from Rheometer curve is related to
(a) Process safety during calendering (b) Process safety during extrusion
(c) Mould flow time (d) Time required for mixing

(xx) The recommended friction ratio of open mill for NR compound mixing (Front : Back)
a) 1:1 b) 1:1.25 c) 1:2.5 d) 1:5

(1 x 20) = 20

2. (a) Sketch different types of calender machine and discuss what for they used.
(b) How friction ratio & temperature of the calender machine are controlled?
(c) Discuss the following operations in a calender machine: (i) frictioning (ii) topping and (iii) sheeting.
(d) What are the defects one comes across during calendering operation and the ways to

tackle them?

(6 + 4+4 + 6) = 20

3. (a) Write down minimum 5 advantages in compression moulding.
   (b) Write down two major disadvantages in transfer moulding.
   (c) What are the three major advantages in Injection moulding?
   (d) Write down recommended moulding temperature in compression, transfer and injection moulding.
   (e) What are the curing processes you will adapt to the following products?
   (i) V-belt (ii) Rubberised cloth (iii) Moulded house (iv) Radial tyre

(5x4) = 20

4. (a) Write down the " Speading Process" of a cotton canvas cloth with sketch.
   (b) Write any five moulding defect observed in compression moulding and suggest remedial solution..
   (c) How will you calculate the "Mould shrinkage" of a rubber article on steel mould?
   (d) Define following common terms used in rubber industry: i) Under cure ii) bumping iii) splicing.

(5 + 5 + 4+6) = 20

GROUP – B

5. (a) Explain platen heating versus dome heating system for tyre curing
   (b) Explain the salient feature of a liquid curing method of vulcanization.
   (c) What are the various techniques followed for 'Mould cleaning' operation & explain them briefly.
   (d) Compare the merits and demerits of Stream curing and Electrical heating curing

(5 + 5 + 5+5) = 20

6. (a) What is extruder?
   (b) Define i) 'single screw' and 'double screw extruder', ii) T head and dual head extruder.
   (c) What are common problem encountered in extruder and their rectification?
   (d) If a circular article is extruded in a cold feed extruder at 85 °C of extrusion temperature, which attains the final diameter of 10 mm at the time of booking, calculate the % die swell if the diameter. of original die is 8 mm.
   (e) What is the function of warming ~~will~~ mill associated with extruder?

(2+6+5 + 5 + 2) = 20

7. (a) Why compounding ingredients are added to the latex in the form of dispersions or emulsions? Discuss how the dispersions and emulsions are prepared?
   (b) Why compounding ingredients are added to the latex in the form of dispersions or emulsions? Discuss how the dispersions and emulsions are prepared?
   (c) How prevulcanized latex is prepared? Discuss the procedure with a typical formulation.

(2+5) + (4+4) + (5 + 5) = 20

8. Write short notes on **(any four)**.
   (a) Ram and screw extruder
   (b) Safety methods used in mixing and extrusion
   (c) Microwave curing
   (d) Upside down mixing of EPDM rubber
   (e) PD and PID controller
   (f) Mooney Viscometer

(4 × 5) = 20