

Date: 22.07.2016

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

Question No. 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) On mastication, molecular weight of the rubber
- (a) Increases (b) Decreases
(c) Remains unchanged (d) None of the above
- (ii) 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.
- (iii) The pH of NR latex as obtained from the tree is
- (a) 5.5 (b) 6.5 (c) 7.5 (d) 8.5
- (iv) 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
(c) L type 3 roll calendar
(d) None of the above
- (v) 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
- (vi) Cambering of calendar rolls are done to
- (a) Increase the life of the calendar rolls
(b) To bring smoothness on the surface of the calendered sheet
(c) To maintain uniform gauge of the calendered sheet
(d) To reduce thickness of the calendered sheet

[Turn Over]

- (vii) When a three roll calender is used for frictioning, the surface speed of the bottom roll is usually
 (a) Equal to the middle roll (b) Slower than the middle roll
 (c) Faster than the middle roll (d) None of the above
- (viii) Mould shrinkage is directly depending upon
 (a) The difference between room temperatures vs. moulding temperature.
 (b) The moulding pressure
 (c) The "Bumping" system
 (d) None of the above.
- (ix) Frictioning is done on one side of the fabric using
 (a) 2 - roll calendar of I type
 (b) 2 - roll calendar of V type
 (c) 3 - roll calendar of I type
 (d) 3 - roll calendar of Inverted 'L' type with difference in roll speed.
- (x) Typical mill friction ratio for NR compound:
 (a) 1:1 (b) 1:1.20 (c) 1:2.0 (d) 1:5
- (xi) Reversion & OCT can be tested by using -
 (a) Mooney viscometer (b) MDR (c) Resiliometer (d) DIN abrader
- (xii) In a two roll mixing mill are fixed for the safety of the mill rolls -
 (a) Aluminium brackets (b) Cast iron breaker pad
 (c) Bronze scales (d) Tutlon Brackets
- (xiii) For uniform platen temperature it is recommended to have as curing media.
 (a) Steam or Thermic fluid (b) Vapor or Hot air
 (c) Tempered water (d) Electric heating
- (xiv) Scorching of rubber compounds takes place due to
 (a) Excessive oil dosage (b) Slow curing accelerators
 (c) Excessive processing temperature (d) Improper black dispersion
- (xv) The fill factor in a Banbury mixer for curative mixing is
 (a) 50 - 55 (b) 60 - 65 (c) 70 - 75 (d) 80 - 85
- (xvi) Microwave heating system is effective for
 (a) Peroxide crosslinked NR (b) Rubber with metal inserts
 (c) Polar rubbers and ingredients (d) Non polar rubbers and ingredients
- (xvii) Green strength of an uncured rubber compound is the
 (a) Ability to show ozone resistance (b) Lack of tack
 (c) Loss of physical properties (d) Ability to maintain stability

(xviii) The Hot Feed Extruders, L/D ratio is

- (a) 2 : 1 (b) 6 : 1 (c) 15 : 1 (d) 20 : 1

(xix) Calender rolls are usually made of

- (a) Alloy steel (b) Carbon steel
(c) Chilled cast iron (d) Grey cast iron

(xx) High temperature & shorter curing time is preferred for –

- (a) Thicker moulded articles
(b) Thin rubber moulded goods
(c) Commonly for all NR products
(d) None of the above

(1 x 20) = 20

2.(a) Write down minimum 5 advantages in compression moulding.

(b) Write down two major dis-advantages 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.

(5 + 5 + 5 + 5) = 20

3.(a) How temperature of the calender rolls, are controlled? What are the media used to heat and cool the roll?

(b) Discuss the following operations in a calender machine: (a) frictioning (b) topping and (c) sheeting.

(c) What are the defects one comes across during calendering operation and the ways to tackle them?

(6 + 8 + 6) = 20

4. (a) Define following common terms used in rubber industry: i) under cure ii) over cure iii) scorching iv) delayed action v) ultra fast vi) bumping vii) nip gap viii) friction ratio ix) splicing x) liner.

(b) Draw a typical curve for a rheometer and explain the different terms associated with it.

(c) Sketch and explain a Mooney curve.

(10 + 5 + 5) = 20

GROUP – B

5. (a) What is extruder? Show with proper diagram different parts of extruder.

(b) What is the function of warming roll associated with extruder?

(c) What are common problems encountered in extruder and their rectification?

(d) Define the following terms

i) Single screw and double screw extruder.

ii) T head and dual head extruder.

(8 + 2 + 4 + 6) = 20

6.(a) Compare the merits and demerits of steam curing and Electrical heat curing.

(b) What are the various techniques followed for 'Mould cleaning' operation & explain them briefly.

(c) What is the relation between saturated steams vs. temperature?

(d) How will you calculate the "Mould shrinkage" of a rubber article on steel mould?

(5 + 5 + 5 + 5) = 20

[Turn Over]

7. (a) Sketch and explain various roll arrangements of calendars.
(b) Explains the various methods to be adopted for obtaining uniform thickness in calendaring.
(c) Explain spreading operation with a diagram
(d) Explain the reasons for scorching and stock blister in calendaring.

(5 + 6 + 5 + 4) = 20

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

- (a) Rotocuring
(b) Temperature control system in Banbury mixer
(c) Ram and screw extruder
(d) Steam versus electrical heating
(e) Steam trap
(f) Mastication

(4 x 5) = 20