Ref. No.: Ex/PRN/PC/B/T/223/2024

BACHELOR OF ENGINEERING IN PRINTING ENGINEERING
2ND YEAR 2ND SEMESTER EXAMINATION 2024
PACKAGING TECHNIQUES-II

Full Marks: 100 **Time: 03 Hrs.**

CO1 (Group1)
Answer any one

1. (a) Distinguish between horizontal impact and vertical impact during distribution of packaged items.
   (b) Distinguish between wrapping and cushioning.
   (c) Distinguish between impact load factor and cushion factor.
   (d) Draw the force deformation characteristics curves for crushing, elastic and bi-linear type cushions.

   5+5+5+5=20

2. (a) How can you find the thickness of a particular cushion being used more efficiently for good cushioning design in a package? Is it at all necessary and why?
   (b) What deformation of an elastic type cushioning material will be required to limit the load factor of a packaged item to 30 if a boxcar is stopped from a speed of 20 miles per hour in a distance of 2.0 inch?

   10+10=20

CO2 (Group2)
Answer any one

3. (a))An item to be packaged weighs 30 pounds, and the supporting suspension system has a spring constant of 100 pounds per inch.. The package is to be shipped by rail freight in train that will be a forcing frequency of 4.0 cycles per second at near about 60 miles per hour. Find the transmissibility of the suspension system used in the package if (i) no damping is provided, (ii) the system has a damping ratio of 0.375, and (iii) if the spring constant is increased to 320 pounds per inch. (no damping) and (iv) spring constant 320 pounds per inch with damping ratio of 0.375. Comment on your answers from the design point of view.

   (b) How can you prevent the package with a content from mechanical shock and strength?

   12+8=20

4. (a) How can a packaged article be subjected to forced vibration? Illustrate with example. How the forced frequency vary with speed of freight car passing over rails and how it is useful for designing a suspension system of a package to provide maximum vibration protection?
   (b) Show the theoretical variation of transmissibility with frequency ration for

different damping values. From this explain the package design considerations for the effective isolation of vibratory forces emanating from a freight car to which the container is rigidly attached

10+10=20

CO3 (Group3)
Answer any one

5. (a) Draw the arrangement of roller conveyor for carrying rectangular shaped box packages and round shaped packages. Also mention the design parameters of the conveyor by showing in the diagram.
(b) What will be the arrangement of the rollers for conveying very small packaged items?
(c) How can you measure G (Impact load factor) reading of a package during drop test?

10+4+6=20

6. (a) How the best packaging material for fragility protection be selected?
(b) How can you compare the efficiencies of two or more packages of the same product?
(c) For investigational testing during dropping of a package of size 45cm x 38cm x 30cm weighing 60 kg gross and holding 80 cartons in two layers arranged in 8x5. Each carton having glass bottles surrounded by double sided corrugated board, stoppers of which are pointed towards 45cm x 38cm face.
i)Show the above arrangement with a neat sketch.
ii)How many positions of falls can be made during drop test? Mention the positions.

5+6+9=20

CO4 (Group4)
Answer any two

7. (a) Why hermetically sealed containers create problem during air transportation?
(b) How the nature of the packaged products changes by the influence of moisture?
(c) Describe the principle of the method for determining the amount (weight and number of units) of desiccant required to maintain a specific relative humidity within a container.

5+5+10=20

8. (a)Derive the exponential decay relation of moisture sensitive packaged item.
(b)From this relation how can you determine the half-value period of the moisture sensitive packaged item?
(c)From the half value period how can you determine the shelf life?

7+5+8=20

9. a) Five packets of cigarettes overwrapped in moisture proof cellulose film are initially weighed in grams and given 33.145, 32.796, 32.771, 32.175 and 32.203 respectively.

They are exposed to a storage atmosphere of 25^0C and 75% R.H. and re-weighed at intervals upto 16 days. Due to moisture gain the following gains in weights of the packets are given below.

Packet No.	Gains after x days' storage (in grams)		
	x=2	x=7	x=16
1	0.079	0.0198	0.412
2	0.088	0.233	0.480
3	0.079	0.197	0.420
4	0.074	0.190	0.406
5	0.046	0.227	0.489

The packets are then completely opened to expose the whole of the contents to the storage atmosphere and allowed to come to equilibrium. The final weights are 36.409, 35.950, 35.887, 35.188 and 35.216 grams respectively.
Determine the half-value period of the cigarette packet.

b) Distinguish between critical moisture content and equilibrium moisture content of a moisture sensitive packaged item.

16+4 = 20