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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017**

COURSE NAME : PACKAGING WITH PAPER AND
PAPERBOARD
COURSE CODE : BNK 30303
PROGRAM : BNK
EXAMINATION DATE : DECEMBER 2016/JANUARY 2017
DURATION : 2 HOURS 30 MINUTES
INSTRUCTION : ANSWER ALL QUESTIONS.

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THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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Q1 Historically, paper was used for packaging around the world in the year 1550. A large proportion of paper and paperboard is used for packaging purposes. About 35% of the total output is used for corrugated and solid fiberboard, and the overall packaging usage is significant.

- (a) Give the definition of paper. (3 marks)
- (b) Explain the differences between paper and pulp. (5 marks)
- (c) Discuss the applications of paper in packaging. Relate the applications with mechanical and optical properties for papers. (7 marks)
- (d) Identify the advantages and disadvantages in utilizing paper and paperboard as a packaging material. (10 marks)

Q2 Many factors can effect the physical properties of paper in packaging application such as printing quality and packaging material converter.

- (a) Identify the factors of paper and paperboard applications as packaging materials. (10 marks)
- (b) Defferentiate the psysical properties of paper are critical for printing quality and packaging material converter purpose below. (15 marks)
 - (i) Caliper or Thickness
 - (ii) Dimension Stability
 - (iii) Machine and cross Direction
 - (iv) Moisture
 - (v) Temperature and Humidity

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Q3 **Figure Q3** shows a stack of corrugated box. The boxes are distorted after a week of storage.

(a) Recognize **Four (4)** causes of distortion. Sketch a diagram to support the answer. (10 marks)

(b) Propose the simple guidelines that will maximize the performance life corrugated box as product storage in warehouse. (15 marks)

Q4 (a) A packaging mill wants to make corrugated board consist of face liner, medium liner and back liner. The mill bought **three (3)** types of liner paper. Data of these liners are listed in a **Table Q4**.

(i) Calculate the grammage (g/m^2) of these papers. (2 marks)

(ii) Calculate the apparent density (g/cm^3) of these papers. (2 marks)

(iii) Determine the tensile indexes (Nm/g) of these papers. (2 marks)

(b) Paper manufacturing industries were established in Malaysia due to a higher demand of paper usage. Paper is manufactured by mechanical and chemical process.

(i) Sketch the diagram of paper manufacturing process. (7 marks)

(ii) The main food applications today are for food wrapping, frozen food and fresh food. Determine the suitable method of post-printing process to protect the packed food and sustain the performance of paper box. (12 marks)

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- END OF QUESTION -

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Figure Q3

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Kraft paper	Weight a sheet of 100 cm² (g)	Thickness of 5 sheets (µm)	Tensile strength of sheet (kN/m)
1	0.2631	530.2	19.084
2	0.2474	529.4	18.831
3	0.2339	532.5	17.062

Table Q4

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