FEDERAL UNIVERSITY OF TECHNOLOGY OWERRI

SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY

DEPARTMENT OF CHEMICAL ENGINEERING

2017/2018 RAIN SEMESTER ENG 308 - ENGINEERING MATHEMATICS II TEST

INSTRUCTION: ANSWER ALL QUESTIONS; TIME ALLOWED: 1HOURS; DATE: WEDNESDAY AUGUST 01, 2018

1) Write the finite difference computational scheme for the derivative $\frac{dw^4}{dz^4}$ **(5 Marks)**

2) Two types of coupling units are produced by a firm. The time needed for machining, polishing and assembling a unit of each type are given below:

Type of unit	Time in hour per unit			Cost (N) per unit
	Machining	Polishing	Assembling	
A	5	1	-1	2
B	2	1	1	5
Time (hr/week)	At most 10	At least 3	Equal to 1	

Find (a) the weekly output of each type needed to minimize cost (b) the minimum weekly cost. **(5 Marks)**

3) The sales manager for a publisher of a textbook has six traveling salespeople to assign to three different regions of the country. He decided that each region will be assigned to at one salesperson and that each salesperson should be restricted to one of the regions, but now she wants to determine how many salesperson should be assigned to the respective regions in order to maximize sales. The following table gives the estimated increase in sales in each region if it were allocated various number of salespersons:

Sales persons	Regions		
	1	2	3
1	35	21	28
2	48	42	41
3	70	56	63
4	89	70	75

Use dynamic programming to solve this problem by constructing the usual tables for n=3, n=2 and n=1. **(5 Marks)**

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INSTRUCTION: ANSWER ALL QUESTIONS; TIME ALLOWED: 1HOURS; DATE: FRIDAY AUGUST 24, 2018

1) Evaluate, using *rectangular* rule, the integral $I = \int_0^1 x^2 \sin\frac{1}{2}x \, dx$ given that $n = 4$ and determine the error associated with the method. [*Hint: A fairly accurate result may be obtained by using the series method expanding* $\sin\frac{1}{2}x$ *to the third term, where* $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$ (5 marks).

2) Using the partial fraction technique, obtain a state space representation for the system below and its state transition matrix:

$y''' + 9y'' + 26y' + 24y = 5u$ (5marks).

3) 3) Discrete Fourier transform allows us to calculate the Fourier transform on a computer. Why is this method not efficient? State the contribution of fast fourier transform to alleviate these problems (5 marks).