UNIVERSITY OF JOHANNESBURG

PROGRAM	:	NATIONAL DIPLOMA *ENGINEERING : INDUSTRIAL*
SUBJECT	:	**MECHANICAL MANUFACTURING III**
CODE	:	**IMV 321**
DATE	:	SUMMER EXAMINATION 2014 6 NOVEMBER 2014
DURATION	:	(SESSION 1) 08:30 - 11:30
WEIGHT	:	40 : 60
TOTAL MARKS	:	100

ASSESSOR	:	MR R P MUTYAVAVIRE
MODERATOR	:	MR S CHIKUMBA FILE NO
NUMBER OF PAGES	:	4 PAGES

INSTRUCTIONS	:	ONLY ONE POCKET CALCULATOR PER CANDIDATE MAY BE USED.
REQUIREMENTS	:	GRAPH PAPER.

INSTRUCTIONS TO STUDENTS

PLEASE ANSWER ALL QUESTIONS.

QUESTION 1

1.1 Briefly, but in good detail, discuss the key features of a materials handling system.

(4)

1.1.2 Give a detailed account of the key differentiating features of Self-guided vehicles and Automated-guided vehicles.

(4)

1.2 A car assembly plant constitutes 40 work stations. An AGV system moves materials amongst the work stations, and on average one load is moved from each workstation per hour. The average loaded distance per vehicle cycle is 80m and the average empty distance is 100m. The average vehicle speed = 65m/min. The total handling time per cycle is = 1.5min. Given that n_c = total number of vehicles in the system, and F_t = traffic factor, given by, $F_t = 1\text{-}0.5(n_c\text{-}1)$. Availability = 100% and worker efficiency = 100%. Determine the minimum number of vehicles to meet the flow rate requirement.

(12)

[20]

QUESTION 2

2.1 With the aid of illustrations, explain the terms blocking and starving of workstations on an assembly line.

(8)

2.2 For a particular assembly line, the following design data is specified:
Total work content = 45mins
Conveyor speed = 0.25m/min
Average production rate = 50pieces/hr
Worker repositioning time = 8secs
Line efficiency = 94%
Manning level = 1.25
Worker efficiency = 90%
Length of each work station = 0.25m

Determine:
(a) Length of the assembly line (8)
(b) Time product spends per work station (4)

[20]

QUESTION 3

3.1 Discuss in good detail any two (2) production conditions that justify implementation of group technology and cellular manufacturing. (4)

3.2 List and briefly explain any three (3) methods of grouping parts into part families. (6)

3.3 A traditional job shop produces nine(9) different component parts, using eight (8) generic machines. The respective machine-part matrix is illustrated in table 3 below. Apply the rank-order clustering technic to identify the part families and machine cells.

Table 3

	Parts								
Machines	A	B	C	D	E	F	G	H	I
1			1	1	1				
2	1	1					1	1	1
3						1	1	1	
4	1	1		1					
5			1		1				
6		1						1	1
7	1		1	1					
8		1				1		1	1

(10)

[20]

QUESTION 4

4.1 Briefly discuss any four (4) performance indices that are used to measure storage system performance. (8)

4.2 Discuss and differentiate the following two (2) storage location strategies: (a) Dedicated storage (2)

(b) Randomised storage (2)

4.3 An IE is required to design an AS/RS to store 1000 pallet loads in a distribution centre. Pallet dimensions are: x = 1000 mm, y = 1200 mm; and the height = 1300 mm. The following is specified: (1) the AS/RS will consist of two aisles with one S/R machine per aisle, (2) length of the structure should be approximately five times its height, and (3) the rack structure will be built 500 mm above floor level. Using the allowances a = 150 mm, b = 200 mm, and c = 250 mm, determine the width, length, and height of the AS/RS rack structure. (8)

[20]

QUESTION 5

5.1 An operative mans two (2) semi-automated grinding machines in a machine shop. The service time per machine is 0.45 min and the repositioning time is 0.20min. The machine automatic cycle time is 2.0 min. Given that the worker's hourly rate = $25/hr and the hourly rate for each machine = $30/hr, determine:

(a) the current hourly rate for the cluster, and

(5)

(b) the current cost per unit of product, given that two units are produced by each machine during each machine cycle.

(5)

(c) What is the % idle time of the worker?

(5)

(d) What is the optimum number of machines that should be used in the machine cluster, if minimum cost per unit of product is the decision criterion?

(5)

[20]

TOTAL = 100
