UNIVERSITY
OF
JOHANNESBURG

PROGRAM	:	NATIONAL DIPLOMA *ENGINEERING: INDUSTRIAL*
SUBJECT	:	**MECHANICAL MANUFACTURING III**
CODE	:	**IMV 321**
DATE	:	SUMMER EXAMINATION 2015 12 NOVEMBER 2015
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.

2/...

INSTRUCTIONS TO STUDENTS

PLEASE ANSWER ALL QUESTIONS.

QUESTION 1

1.1 With the aid of illustrations, differentiate fixed routing from variable routing in manufacturing systems.

(4)

1.2 Product variety is critically important in modern day marketing. Manufacturing system flexibility is a pre-requisite to a company's ability to offer a wide product range. Discuss any three (3) enablers for flexibility in manufacturing.

(6)

1.3 A manufacturing cell consists of forging machines. The cell is scheduled to produce 1000 crank shafts in one week. The week consists of 5 working days. Given, cycle time per product = 16.0mins, set up time per machine = 4hrs, and defectives rate = 2%.

(a) How many machines are required in the cell to meet the production demand?

(5)

(b) If the company has only two (2) functional forging machines, how many shifts would you need to plan for in order to meet the demand in one week?

(5)

[20]

QUESTION 2

A machine operator is assigned two machines in a machine cell. The service time per machine is 0.40 min and the time to walk between machines is 0.20 min. The machine automatic cycle time is 2.0 min. If the worker's hourly rate = R10/hr and the hourly rate for each machine = R25/hr, calculate:

(a) The hourly operating cost for the cell

(5)

(b) The unit production cost, assuming two units are produced by each machine during each machine cycle.

(5)

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

(5)

(d) Determine the maximum number of machines that should be allocate in each machine cell, in order to achieve the lowest production cost.

(5)

[20]

QUESTION 3

3.1 With respect to assembly line design, explain the difference between cycle time, T_c and service time, T_s. (4)

3.2 An Industrial Engineer has been assigned to design a single model assembly line to produce 400 000 electric jugs per annum. The assembly line will operate two (2) 8hr shifts per day, five days per week, 50 weeks per annum. Total Work content time = 35 mins. Line availability is estimated at 95%. Determine:

(a) Average hourly production rate, R_p. (3)

(b) Cycle time, T_c. (3)

(c) Theoretical minimum number of workers on the line. (5)

(d) Given balance efficiency is 0.93, and T_r = 6 secs, how many workers will actually be required. (5)

[20]

QUESTION 4

An automated assembly line has six stations that function as illustrated in table 4.1 below:

Table 4.1

Station	Operation	Process time	p_i
1	Receiving	0.78 min	0
2	Drilling	1.25 min	0.02
3	Reaming	0.90 min	0.01
4	Taping	0.85 min	0.04
5	Milling	1.32 min	0.01
6	Packaging	0.45 min	0

In addition, transfer time = 0.18 min. Average downtime per occurrence = 6.0 min. A total of 18,000 parts must be processed through the assembly line. Determine:

(a) Proportion downtime, (5)

(b) Average actual production rate, (5)

(c) Hours of operation required to produce the 18,000 parts?

(10)
[20]

QUESTION 5

5.1 Briefly discuss any four (4) typical advantages of cellular manufacturing over conventional manufacturing practices.

(8)

5.2 Explain any two (2) methods used to classify engineering component parts into part families.

(4)

5.3.1 Discuss in good detail Automatic Identification and Data Capture. (2)

5.3.2 What are the three (3) main elements of AIDC technologies ?

(6)

[20]

TOTAL = 100
