

PROGRAM : NATIONAL DIPLOMA

INDUSTRIAL ENGINEERING TECHNOLOGY

SUBJECT : ENGINEERING WORK STUDY II

<u>CODE</u> : TIV 231

DATE : MID-YEAR EXAMINATIONS 2016

03 JUNE 2016

<u>DURATION</u> : 8:30-11:30

WEIGHT : 40:60

TOTAL MARKS : 100

EXAMINER : MRS R. STEENKAMP

MODERATOR : MR G. DE CLERCQ

NUMBER OF PAGES : 4 PAGES

ANNEXURES 4 PAGES

REQUIREMENTS : STUDENTS MAY USE CALCULATORS

GRAPH PAPER IS REQUIRED

INSTRUCTIONS TO CANDIDATES:

1. PLEASE ANSWER ALL THE QUESTIONS.

2. SHOW ALL THE CALCULATIONS.

3. FOR ANY DATA NOT PROVIDED; STUDENTS ARE EXPECTED TO MAKE REALISTIC ASSUMPTIONS

QUESTION 1

1.1.	Name three general rules that help with workplace layout from	
	an ergonomic point of view.	(3)
1.2	When an operator is working in a standing position name three	factors to
	consider from an ergonomic point of view.	(3)
1.3	What is facilitation?	(2)
1.4	What is plant and machine control?	(2)
1.5	What is the typical hierarchy of document?	(4)
1.6	What is the purpose of an X-chart?	(2)
		[16]

QUESTION 2

An operator produces 275 pieces per day, the standard time for an operation is 1.6 min per piece. The operator has an 8.5 hour working day; he does however have 25 minutes waiting time during the day. The operator has a base rate of R175 per hour. Calculate

- 2.1 Standard hours earned
- 2.2 Operators efficiency
- 2.3 Direct labour cost per piece at this efficiency
- 2.4 Labour utilisation
- 2.5 Labour productivity

[10]

QUESTION 3

Do a PTS analyses for the following process and what is the total tmu?

3.1. Get a handful of washers from a container jumbled together and put them onto 3 bolts located 12cm apart. (9)

3.2. A worker slides a ruler (20cm) and pushes it 14 cm to measure two points that are 20 cm apart process stops at measurement. (7)

[16]

QUESTION 4

The company has established base rate to produce polymer tubes of different diameter and length. Operators are experienced in this process.

	Diameter		40	
	10mm	20mm	30mm	40mm
Length	Sec	Sec	Sec	Sec
1m	15	25	35	40

1.5m	20	30	40	45
2m	25	35	45	50
2.5m	30	40	50	55

Formulas

T = a1 + (a2 - a1)f

T=base time x factor

- 4.1 Determine by calculation the time for producing a tube that has a diameter of 25mm and a length of 1.75m
- 4.2 Determine by graphical factor comparison the time to produce a tube that has a diameter of 15mm and a length of 2.25m. Use a length of 2m to determine the factor curve.

[<u>15</u>]

QUESTION 5

Draw a cause and effect diagram of all the reasons why runs are scored in cricket. A study was completed and the following was found the number of runs scored is influenced by the batting position, the bowling style as well as the batting style. The fitness and amount of practice before the match also has an influence on the number of runs scored. Different pitches tend to influence either high or low scores. The outfield conditions also influence the game and the number of scores. Outside factors that play a role are things like the weather and the venue. The batting partners also seem to affect the score. For the players their gear also influences how well they play and score; things such as the type of bat, the type of ball and the type of protective gear that they wear.

[12]

QUESTION 6

The following was observed of a office worker. The office worker spent up to 8 hours sitting at the computer per day, with few breaks. The office worker had heavy usage of the mouse, which was positioned away from the keyboard on the right hand side (RHS). The telephone was used frequently. The office worker also tended to cradle handset into the neck to free both hands for computer use. The worker had a height adjustable chair and a fixed height desk. Seat height was particularly low, requiring User to rest forearms on the desktop when keying. Frequently used items (e.g. cell phone, stationery) were positioned at the rear of the desk.

Name six things that you would recommend from an ergonomic point of view to improve this process.

[6]

QUESTION 7

Draw a single column process chart of the following process

Receive raw resin and other components at the store, visual inspection is done of components. All defective components are segregated and returned. All components that are acceptable are booked into the store. The resin is taken from the store to the lab where resin verification is done. The operator waits for the verification to be completed and then takes the resin to his work station. At the workstation the operator sets up his machine for production.

[12]

QUESTION 8

Wow-manufacturing has approached you as the industrial engineer to determine which of the following incentive schemes will be best for them they want to motivate workers but are constrained by the budget. A group of employees work a 40-hour working week, a worker needs to complete a 1200 pieces per week. The hourly pay is R90. A worker completes the work in 36 hours. Calculate the bonus and total earnings for the following schemes

	0	
8.1.	Guaranteed scheme	(3)
8.2	Halsey Premium bonus scheme	(3)
8.3.	Halsey- Weir	(3)
8.4.	Rowan Scheme	(3)
8.5	Which Scheme would you recommend and why?	(1)
		[13]

TOTAL: 100 Full marks 100

Table 24. Methods-Time Measurement application data in tmu (Based metric weights and measures)

Distance (cm)	će	Time	(lmu)		,	Hand	in motion	Case and description
		A	Ė	Corp	E	A	В	·
2 or 4 6 8 10	less	2.0 3.4 4.5 5.5 6.1	1		2.0 3.2 4.4 5.5 6.8		1.6 2.4 3.1 3.7 4.3	A. Reach to object in fixed location, or to object in other hand on which other hand rests
12 14 16 18 20		6.4 6.8 7.1 7.5 7.8	7.4 8.2 8.8 9.4 10.0	9.1 9.7 10.3 10.8 11.4	7.3 7.8 8.2 8.7 9.2	5.2 5.5 5.8 6.1 6.5	4.8 5.4 5.9 6.5 7.1	B. Reach to single object in location which may vary slightly from cycle to cycle
22 24 26 28 30		8.1 8.5 8.8 9.2 9.5	10.5 11.1 11.7 12.2 12.8	11.9 12.5 13.0 13.6 14.1	9.7 10.2 10.7 11.2 11.7	6.8 7.1 7.4 7.7 8.0	7.7 8.2 8.8 9.4 9.9	C. Reach to object jumbled with other objects in a group so that search and select occur
35 40 45 50	1 1:	0.4 1.3 2.1 3.0 3.9	14.2 15.6 17.0 18.4 19.8	15.5 16.8 18.2 19.6 20.9	12.9 14.1 15.3 16.5 17.8	8.8 9.6 10.4 11.2 12.0	11.4 12.8 14.2 15.7 17.1	D. Reach to a very small object or where accurate grasp is required
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	Destription	Pick up grasp — smell, medä	Vary small object or object by	Interference with grasp on bottom and one side of nearly Qdindrical object. Disimeter larger than 12 mm	Interference with grasp on bottom and one side of nearly opindrical object. Diametos 6 to 12 mm	Interference with grasp on bottom and one side of neurly cylindrical object. Dlameter less than 6 mai	Regrasp	Transfer grasp	Object jumbhat with other objects so sharth and select otour. Larger than $25 \times 25 \times 25$ mm	Object jumpled with other objects so search and select ozzur. $6\times6\times3$ mm to $25\times25\times25$ mm	Object jumbled with other objects so search and select equir. Smaller than 6×6×3 ram	Contact, sliching or hook grasp
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3. Tight — Considerable effort, hand recoils markedly.	22.9	7. 325

VIII. EYE TRAVEL and EYE FOCUS — ET and EF

Eye traval time = $15.2 \times T$ true, with a maximum value of 20 tmu D

where T = the distance between points from and to which the eye terryck, D = into perpendicular distance from the eye to the flux of bravel T. Eye focus time = 7.3 time.

INTRODUCTION TO KINRY STUDY

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		30 cm Each extra cm	17.0
Case 2 — Lagging lag must contact floor before next motion can be made	SS .	Up to 30 cm Each extra cm	34.1

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Bend, stoop, or knost on one knee Arisa Kneel on floar — both knees Arisa	Stand from sitting position Turn body 45 to 90 degrees:	Case 1 — Complete when leading leg contacts floor	Case 2 — Lagging leg must contact floor before hert motion can be made

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W-M W-P W-PO

Walk — obstructed

WESTR Walk W = Within the area of normal vision, i.e. $r=10\,\mathrm{cm}$, d = 40 cm, O = Outside the area of normal vision, i.e. $r=10\,\mathrm{cm}$, d = 40 cm.

E = EASY to handle.

D . DIFFICULT to handle.

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120° 135° 150° 165° 6.8 7.4 8.1 6.7 1.6 11.5 12.7 13.7 1.4 22.2 24.3 26.1 1.4 22.2 24.3 26.1 1.5 Description Apply force Release force
150 165* 8.1 6.7 12.7 13.7 24.3 26.1 24.3 26.1 Description Description Release force Release force

PATHODUCTION TO MORE STUDY



Predetermined that Standard