PROGRAM: NATIONAL DIPLOMA
INDUSTRIAL ENGINEERING TECHNOLOGY

SUBJECT: ENGINEERING WORK STUDY II

CODE: TIV 231

DATE: MID YEAR SUPPLEMENTARY EXAMINATION
15 JULY 2014

DURATION: 11:30 – 14:30

WEIGHT: 40 : 60

TOTAL MARKS: 100

EXAMINER: MRS STEENKAMP
MODERATOR: MR. A. BALOYI

NUMBER OF PAGES: 4 PAGES
ANNEXURE 5 PAGES

REQUIREMENTS: STUDENTS MAY USE CALCULATOR

INSTRUCTIONS TO CANDIDATES:

PLEASE ANSWER ALL THE QUESTIONS.
QUESTION 4

Do a PTS of the following part of a process of packing a mixed box of stationary.

The operator takes a box of red pens (40cm) and places it in the box in front of him (25 cm) he needs to position the pens in the box so that he can neatly pack all the stationary into the box. He then gets a box of blue pens and places it in the box (30cm).

[10]

QUESTION 5

The time to surface treat bars with different Width and Length are given below

<table>
<thead>
<tr>
<th>Width</th>
<th>15mm</th>
<th>30mm</th>
<th>45mm</th>
<th>60mm</th>
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<tbody>
<tr>
<td>Long</td>
<td>Sec</td>
<td>Sec</td>
<td>Sec</td>
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<tr>
<td>10cm</td>
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<tr>
<td>40cm</td>
<td>80</td>
<td>90</td>
<td>100</td>
<td>110</td>
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</table>

Formulas:
T = a1+(a2-a1)f
T=base time x factor

5.1 Determine by calculation the time for surface treating a bar that is 20mm wide and 25cm long
5.2 Now use graphical factor comparison to determine the time for surface treating such a bar. Use a Length of 20cm to determine the factor curve.

[15]

QUESTION 6

Do a two handed process chart of the following process

A nurse is giving an injection to a patient. She takes a syringe with her RH and then she takes the medication with the Left hand (LH) she fills the syringe using both hands. She then pushes any air bubbles out with her RH. She places the syringe and medicine on table. She takes a cleaning swab with her right hand (RH) and she opens it using both hands. She cleans the patients arm with the swab (RH) and holds package in LH. She discards package and swab. She injects the patient with RH holding the syringe and left hand holding the arm. She places the syringe on the medical waste container RH. She gives a plaster to the patient with RH.

[12]
QUESTION 1

1.1 Name three indirect costs of occupational accidents. (3)
1.2 Name five advantages of open plan layout. (5)
1.3 When forms are designed what must you focus on in terms of the content of the form (3)
1.4 What are the five rules for Brainstorming (5)
1.5 Name five disadvantages of the PTS system (5)
1.6 The summaries of all the data that the Technical set up is based on needs to be attached to it; name three items that should be attached. (3) [24]

QUESTION 2

The flash sportswear company has decided to offer bonuses to their workers as a motivational tool. The management has approached you to determine which system would be best from an economic standpoint for them to use. The company work a 40-hour work week, the worker completes the work in 36 hours. The hourly pay is R120.

Determine the bonus and total earnings for each of the following:
5.1 The Guaranteed scheme (3)
5.2 The Halsey scheme (3)
5.3 The Halsey-Wair scheme (3)
5.4 The Rowan scheme (3)
5.5 Which scheme would you advise the company to use and why? (1) [13]

QUESTION 3

Draw a cause and effect diagram of the following problem. One of the branch offices is uncooperative and the manager has decided to investigate the situation. He found that the site the branch was located in was in a rundown area, the building itself was spacious and friendly but the surrounding area had a high crime rate and was rather depressing. The equipment at the branch was reasonably modern however they have been experiencing a lot of problems with their e-mail, the system was down for a significant period. It was found that some staff members are de-motivated and capable only when supervised closely although some members were efficient and productive. The manager has had several very urgent tasks to complete which has prevented contact with head office. The manager missed the last branch managers meeting. The work done by the branch was mainly good but some sales have declined recently probably due to the area they are situated in. [10]
QUESTION 7

The operator works for 12 hours a day the operator has a daily waiting time of 25min. Standard time for an operation is 2.5 min per piece. The operator produces 280 pieces per day. The operator has a base rate of R75 per hour.
Calculate
7.1 Standard hours earned (2)
7.2 Operators efficiency (2)
7.3 Direct labour cost per piece at this efficiency (2)
7.4 Labour utilisation (2)
7.5 Labour productivity (2)

[10]

QUESTION 8

An operator has to lift 15kg component from a box on the floor to the work surface. He has to reach across the table (1m) for his tools. The process is a repetitive process that he has to repeat 80 times per day, he remains standing all day. The table surfaces are sharp as are the surfaces of the components he is working with. After a day of work he has neck pain and arm and shoulder pain he has also on several occasions sustained cuts on his hands and wrists.

How will you improve this process from an ergonomic point of view. [7]

TOTAL : 101
Full marks : 100
### Table 24. Methods-Time Measurement application data in tmu (Based metric weights and measures)

#### REACH — R

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<th>C or D</th>
<th>E</th>
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<td>27.7</td>
<td>23.9</td>
<td>15.9</td>
<td>24.2</td>
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</table>

#### Case and description:

- **A. Reach to object in fixed location, or to object in other hand or to which other hand rests**
- **B. Reach to single object in location which may very slightly from cycle to cycle**
- **C. Reach to object jumbled with other objects in a group so that search and select occur**
- **D. Reach to a very small object or where accurate grasp is required**
- **E. Reach to indefinite location to get hand in position for body balance or next motion or cut of way**
| 1. | 3.0 | Pick up group — small, medium or large object by hand, easily grasped. |
| 2. | 5.5 | Very small object or object being placed against a flat surface. |
| 2. | 7.2 | Insertion with grip on bottom and one side of nearly cylindrical object, diameter less than 12 mm. |
| 2. | 8.7 | Insertion with grip on bottom and one side of nearly cylindrical object, diameter 12 to 15 mm. |
| 2. | 10.8 | Insertion with grip on bottom and one side of nearly cylindrical object, diameter less than 6 mm. |
| 9.6 | | Ring grip. |
| 9.6 | | Transfer group. |
| 7.3 | | Object handled with either object on search and select occasion. Diameter less than 25 to 35 mm. |
| 8.1 | | Object handled with either object on search and select occasion. Diameter less than 25 to 35 mm. |
| 12.9 | | Object handled with either object on search and select occasion. Diameter less than 6 to 8 mm. |
| 9 | | Contact, sliding or block grip. |
### DC. BODY, ARM AND FOOT MOTIONS

<table>
<thead>
<tr>
<th>Description</th>
<th>Symbol</th>
<th>Distance</th>
<th>Time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot motion — Helped stance, With heavy pressure</td>
<td>FM</td>
<td>Up to 10 cm</td>
<td>0.1</td>
</tr>
<tr>
<td>Leg or toe-lag motion</td>
<td>T-L</td>
<td>Up to 15 cm</td>
<td>0.1</td>
</tr>
<tr>
<td>Sidestep — Case 1: Complete when leading leg contacts floor</td>
<td>S-S1C1</td>
<td>Less than 30 cm</td>
<td>Use REACH or MOVEMENT</td>
</tr>
<tr>
<td>Case 2: Legging leg must contact floor</td>
<td>S-S2C2</td>
<td>Up to 30 cm</td>
<td>0.1</td>
</tr>
<tr>
<td>Bend, stoop, or lean on one knee</td>
<td>B.S.</td>
<td>11.2</td>
<td></td>
</tr>
<tr>
<td>Sit on floor</td>
<td>SIT</td>
<td>11.2</td>
<td></td>
</tr>
<tr>
<td>Sit on floor — both knees</td>
<td>SIT</td>
<td>11.2</td>
<td></td>
</tr>
<tr>
<td>Sit on back of chair</td>
<td>SIT</td>
<td>11.2</td>
<td></td>
</tr>
<tr>
<td>Stand from sitting position</td>
<td>STD.</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>Turn body 90 or 180 degrees</td>
<td>TURN</td>
<td>18.2</td>
<td></td>
</tr>
<tr>
<td>Walk</td>
<td>WALK</td>
<td>17.4</td>
<td></td>
</tr>
<tr>
<td>Walk — obstruction</td>
<td>WALK</td>
<td>17.4</td>
<td></td>
</tr>
</tbody>
</table>

### SIMULTANEOUS MOTIONS

- EASY: can be performed simultaneously with practice.
- DIFFICULT: may be EASY, requires practice, or difficult. Each case must be studied.

<table>
<thead>
<tr>
<th>Position</th>
<th>Class 1</th>
<th>Class 2</th>
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<tbody>
<tr>
<td>REACH</td>
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<td>E</td>
</tr>
<tr>
<td>MOVE</td>
<td>E</td>
<td>E</td>
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<tr>
<td>GRASP</td>
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<td>E</td>
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<tr>
<td>RESTORE</td>
<td>E</td>
<td>E</td>
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<tr>
<td>DECREASE</td>
<td>E</td>
<td>E</td>
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</tbody>
</table>

**Motions Not Included in above Table:**
- TURN = Neurally EASY with all positions except when TURN is combined with other motions.
- APPLY PRESSURE CRANKS = May be EASY, requires practice, or difficult. Each case must be studied.

**Position:**
- Class 1: Always EASY, EASINESS; Class 2: Normally EASY, RELEASE — Always EASY, EASINESS; Any eyes may be DIFFICULT if case must be searched to avoid injury or damage to object.

- W = Within the personal visual limit, L = 10 cm, d = 40 cm.
- Q = Outside the area of visual reach, L = 10 cm, d = 40 cm.
- E = EASY to handle.
- D = DIFFICULT to handle.

Some clinical information on EASINESS and EASINESS, and the relationship of these to the performance of the task, is discussed.