

**B. Prod. E. Exam, 2017**

(3-rd Yr., 2-nd Sem.)

**Ergonomics & Work Design**

T:3 Hrs.

F M -100

Use separate Answer-scripts for each part.

**Part – I (60 marks)**

Answer any 3 Q,s

1. a) Discuss in details about the guidelines for hand-tool design. 10
- b) What are the preferred work postures for the following tasks? (Give 2 choices for each)
- i) Extended horizontal reaching
- ii) Lifting more than 5 kg. 2X2
- c) Explain with examples of usage areas:  
ARP, HARP, HRP. 6
2. a) Describe the Biomechanical Model for lifting. 5
- b) Sketch human figure(s) & show the following: 5  
Functional forward reach, Stature, Shoulder (Acromian) height, Buttock-knee depth, Inter-pupillary distance.
- c) What is the expression of RWL as suggested by NIOSH? Discuss in details. What is NIOSH? 5+1
- d) Write short notes on:  
ATP, Metabolism. 4
3. a) What are the basic grips? Sub-categorize. Give examples. 5

b) What is the generic source of the name, "Ergonomics"? Who has first used this word? What does "Ergonomics" deal with? 1+1+3

c) What are the primary causes of RMIs? 5

d) Write the thermal balance eqn. of the human body. Explain each term. 5

4. a) Write short notes on:

Acclimation, Acclimatization. 1+3

b) Describe the control movements stereotypes. 6

c) For reducing CTDs, indicate the guidelines in designing hand tools. 6

d) What is the value & significance of Bennett's bend? 2

e) In the formula

$I_p = 20 \cdot \log(p/p_0)$  explain each term. 2

5. a) Differentiate betn. illuminance & luminance. What are their units? 3

b) What are the hearing protectors, commonly used in industries? Does cotton give much protection as a hearing protector? 2+1

c) For manual lifting, what is the so-called "Correct lifting technique"? What are its limitations? 1+2

d) What is the expression & recommended value of LI? 2

e) What is contrast ratio & modulation contrast? Which one is more relevant to the human eye? 2+1

f) To reduce heat stress, suggest six measures which can be taken. 3

g)  $D = \sum(c_i/T_i)$

What does the abovementioned formula denote? What is the maxm. permissible value of

D? 2+1

**Part II**

**(Answer any two questions)**

6. (a) Describe the purpose and steps of method study. (12)
- (b) Write short notes on the followings:  
(i) Multiple activity chart and (ii) Therbligs. (4×2)
7. (a) What are the different economic considerations taken into account for undertaking method study? (8)
- (b) Define work measurement. What are the different techniques of work measurement? (6)
- (c) Describe the role of motion study in enhancing productivity. (6)
8. (a) State the Indian Factory Act for fencing of machineries. (6)
- (b) Describe Rowan incentive plan and Merrick multiple piece rate plan. (4)
- (c) In a time study for a job done by a worker whose rating is 80%, the following data are as follows:  
Observed time = 15 minutes, personal needs allowance = 3% of the basic time, fatigue allowance = 2% of the basic time, contingency work allowance = 2% of the basic time and contingency delay allowance = 1% of the basic time.
- Determine (i) basic time, (ii) work content, and (iii) standard time. (10)