

B.E. PRODUCTION ENGINEERING THIRD YEAR SECOND SEMESTER – 2019**ERGONOMICS & WORK DESIGN**

Time:3 Hrs.

Full Marks -100

Use separate Answer-scripts for each part.

Part – I (60 marks)

Answer any 3 Q.s

1. a) Write the thermal balance eqn. of the human body. Explain each term. 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 is contrast ratio & modulation contrast? Which one is more relevant to the human eye? 2+1
 d) What are the basic grips? Sub-categorize. Give examples. 5
 e) What is the expression & recommended value of LI? 2
2. a) Describe the Biomechanical Model for lifting. 5
 b) Describe the control movements stereotypes. 6
 c) Sketch human figure & show the following: 5
 Functional forward reach, Stature, Shoulder (Acromian) height, Buttock-knee depth, Inter-pupillary distance.
 d) Write short notes on: 4
 ATP, Metabolism.
3. a) Discuss in details about the guidelines for hand-tool design. 10
 b) What are the primary causes of RMIs? 5
 c) What are the hearing protectors, commonly used in industries? Does cotton give much protection as a hearing protector? 2+1
 d) What is the value & significance of Bennett's bend? 2
4. a) Differentiate between illuminance & luminance. What are their units? 3
 b) Explain with examples of usage areas: 6
 ARP, HARP, HRP.
 c) For reducing CTDs, indicate the guidelines in designing hand tools. 6
 d) In the formula 2
 $I_p = 20 \cdot \log(p/p_0)$ explain each term.
 e) To reduce heat stress, suggest six measures which can be taken. 3
5. a) What are the preferred work postures for the following tasks? (Give 2 choices for each)

[Turn over

- i) Extended horizontal reaching
- ii) Lifting more than 5 kg. 2X2
- b) Write short notes on:
Acclimation, Acclimatization. 1+3
- c) What is the expression of RWL as suggested by NIOSH? Discuss in details. What is NIOSH? 5+1
- d) For manual lifting, what is the so-called "Correct lifting technique"? What are its limitations? 1+2
- e) $D = \sum(c_i/T_i)$
What does the abovementioned formula denote? What is the maximum permissible value of D? 2+1

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2019
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Part II**

(Answer any two questions)

- 6.(a) Describe in details the principles of motion economy with respect to the use of the worker's body, and design of the workplace, tools and equipment. (15)
- (b) State the Indian Factory Act for work on or near machinery in motion. (5)
- 7.(a) What factors should be kept in mind while selecting the job for motion study? (10)
- (b) Outline the basic procedure of method study. (6)
- (c) What is a string diagram? Where is it used? (4)
- 8.(a) What are the objectives of a good wage incentive plan? (6)
- (b) What are the different types of wage incentive plan? (4)
- (c) Write short notes on (a) Emerson efficiency plan and (ii) Bedeaux point plan. (5x2)