GX644

OLLSCOIL NA hÉIREANN
The National University of Ireland

National University of Ireland, Galway.

Michaelmas Examinations, 2000/01

B.E. Degree (Mechanical & Biomedical) Examination

BIOMEDICAL PRODUCTION & ENVIRONMENTAL SERVICES

Professor J.J. O'Connor
Professor J.F. McNamara
Dr. G. Fleming
Dr. M.Bruzzi
Dr. J. Patching
Mr. A. Furey

Attempt FIVE questions, including at least ONE question from each section.
Use SEPARATE ANSWER BOOKS for each section.
Time Allowed: 3 Hours

SECTION A

1 Discuss the main sources of contamination within a cleanroom and how it may be controlled. *(20)*

2(a) Discuss the design of change areas for a cleanroom. Include in your discussion change-room protocol which should be followed. *(8)*

(b) Discuss the different types of cleanroom garments commonly available. Give an outline on donning procedures for these garments and discuss the cleaning of such garments. *(12)*

SECTION B

3 Write an essay on the epidemiology of waterborne diseases.
OR
"Air can act as a vector for the transmission of disease". Discuss. *(20)*

4. Discuss the use of ionising radiation for achieving product sterility. How would you validate such a process. *(20)*

SECTION C

5 (a) What is Atherosclerotic disease? What does PTCA stand for and describe how a PTCA catheter may be used to treat this disease i.e. surgical procedure. *(6)*

(b) What are the advantages and disadvantages of "Balloon Stenting"? What do you understand by the term "IH" ? List the design inputs that should be considered when designing a balloon stent. *(8)*

(c) Describe, with the aid of diagrams, any <u>two</u> Balloon Stenting surgical procedures. *(6)*

6 (a) Describe, using diagrams, the critical features of the following anaesthesiology products:
Tracheal Tube, Bronchocath. *(4)*

(b) Complete a Design FMEA for a tracheal tube. Show that you understand the concept and construction of an FMEA. You should consider five potential failure modes. *(8)*

(c) Provide a manufacturing flow chart for a Tracheostomy Tube. Show how each component is manufactured and linked to the Final Product Assembly. *(8)*

7 (a) In the Orthopaedic Industry, Knee Implants are divided into two categories: Fixed bearing and Rotating Platform Knee Systems. What are the differences between these systems. What factors affect polyethylene wear ? *(4)*

(b) List the components used in the construction of a Fixed Bearing Knee System and the Design Inputs associated with each component. *(8)*

(c) Complete a manufacturing flowchart for a Textured Finish Femoral Knee Component. List all the manufacturing operations. Provide a detailed flow chart of a casting process. *(8)*

8 (a) What do you understand by the following terms:
Crossability: DOE; Pareto Analysis; Financial Measurements; *(4)*

(b) Describe, using diagrams, the Investment Casting Process used to Manufacture Orthopaedic Femoral hip components. *(6)*

(c) Complete a Design FMEA for a Knee Forging (Tibial Tray). Show that you understand the concept and construction of a Design FMEA. You should consider 5 potential failure modes. *(10)*