

MANIPAL UNIVERSITY

SECOND SEMESTER M.Sc. R.P. DEGREE EXAMINATION – JUNE 2013

SUBJECT: RESEARCH METHODOLOGY AND BIO-STATISTICS
(NEW REGULATION)

Tuesday, June 11, 2013

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

✍ **Answer all questions.**

- 1A. Define sampling, sampling frame, sampling error and non-sampling error.
- 1B. A study was planned to find whether there is any difference in the average RBC Cholinesterase values (measured in micro mol/min/ml) between alcoholic and non-alcoholic adult males. What should be the minimum sample size required in each group to detect a clinical significant difference of 3 micro mol/min/ml at 80% power and 5% level of significance? Assume that pooled standard deviation of RBC Cholinesterase values is 5 micro mol/min/ml. ($Z_{1-\alpha/2} = 1.96$, $Z_{1-\beta} = 0.84$).
- (4+6 = 10 marks)
- 2A. What is meant by Standard error? Write any two applications of standard error in statistical inference?
- 2B. Briefly explain different measures of central tendency.
- (5+5 = 10 marks)
- 3A. Write down the steps involved in Research process.
- 3B. Describe Binomial distribution with an example.
- (6+4 = 10 marks)
4. The pulse rate of 6 patients are measured before and after administering a drug.
- | | | | | | | |
|-------------------------------|----|----|----|----|----|----|
| Pulse rate before taking drug | 72 | 70 | 68 | 67 | 73 | 71 |
| Pulse rate after taking drug | 74 | 72 | 69 | 68 | 72 | 71 |
- 4A. Name the statistical test used for find whether there is significant difference in pulse rate before and after administering the drug.
- 4B. State the null and alternate hypothesis.
- 4C. What are the assumptions for this test?
- 4D. Compute the test statistic value.
- (1+2+2+5 = 10 marks)
- 5A. Define Epidemiology and enumerate the uses of epidemiology.
- 5B. What do you mean by blinding in randomised control trial? What is the use of blinding and define various types of blinding?
- (5+5 = 10 marks)
- 6. Write short notes on:**
- 6A. One way ANOVA.
- 6B. Logistic regression.
- 6C. Reliability of diagnostic tests.
- 6D. Meta analysis.
- 6E. Relative risk and odds ratio.
- 6F. Non-parametric tests

(5×6 = 30 marks)



MANIPAL UNIVERSITY

SECOND SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JUNE 2013

SUBJECT: RADIATION PHYSICS, RADIATION QUANTITIES AND UNITS

Thursday, June 13, 2013

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

✍ Answer the following:

- 1A. Discuss in detail dosimetric quantities.
- 1B. Both photoelectric effect and Compton effects arise due to the action of photons on electrons, but the two effects are not same. Explain this.

(15+5 = 20 marks)

2. Discuss in detail about the interaction of neutrons with matter.

(20 marks)

- 3A. Discuss different decay modes.

- 3B. Write short notes on Specific Ionization, Stopping Power and LET.

(10+10 = 20 marks)

4. Answer the following:

- 4A. Write a short note on Relative Biological effectiveness.

(5 marks)

- 4B. i) Derive the equivalence of one universal mass unit in terms of MeV.

- ii) How will you calculate the number of electrons per gram of an element? Find for Cobalt -60.

(2½+2½ = 5 marks)

- 4C. Define specific activity. Derive an expression for the same.

(5 marks)

- 4D. Write a short note on Stochastic and non-stochastic quantities.

(5 marks)



MANIPAL UNIVERSITY

SECOND SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION– JUNE 2013

SUBJECT: RADIATION SOURCES AND RADIATION GENERATING EQUIPMENTS

Saturday, June 15, 2013

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

✍ Answer all the questions.

1. Explain in detail about the construction and working of a Cobalt -60 teletherapy unit with its source design and various accessories used.

(20 marks)

2. Discuss the following X-ray generators in detail:

2A. Three phase generator

2B. Medium frequency generators

(10+10 = 20 marks)

3. Discuss in detail about the construction and working of the following:

3A. Betatron

3B. Microtron.

(10+10 = 20 marks)

4. Answer all the questions.

4A. Discuss heat production and dissipation in x-ray tubes.

4B. Describe the role and typical properties of flattening filters used in linacs.

4C. Explain briefly how x-ray production (in x-ray tube) efficiency can be increased.

4D. Write briefly about Magnetron.

(5×4 = 20 marks)



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MANIPAL UNIVERSITY

SECOND SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION- JUNE 2013

SUBJECT: RADIATION DETECTION, MEASUREMENT AND INSTRUMENTATION

Tuesday, June 18, 2013

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

Answer all questions.

1. Explain in detail about the construction, discharge mechanism and quenching agents of the G.M.Counter
(20 marks)
2. Discuss in detail principle, working and applications of scintillation detectors.
(20 marks)
3. Discuss in detail the principle of Fricke, FBX dosimeters and absorbed dose to water determination.
(20 marks)
4. **Write a short notes on:**
 - 4A. Portable survey meters.
 - 4B. RIA counters.
 - 4C. Semiconductor detectors.
 - 4D. Brachytherapy dosimeter.

(5×4 = 20 marks)



MANIPAL UNIVERSITY

SECOND SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JUNE 2013

SUBJECT: RADIOBIOLOGY AND RADIOBIOLOGICAL BASIS OF RADIOTHERAPY

Thursday, June 20, 2013

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

1. Answer the following questions:

- 1A. Explain the effect of ionizing radiation on mammalian skin.
- 1B. Write a short note on genetically significant dose (GSD).
- 1C. Write a short note on Compton Effect.
- 1D. Explain Reoxygenation of tumors and its significance in radiotherapy.

(5×4 = 20 marks)

2. Answer the following questions briefly:

- 2A. Describe in brief about various types of chromosomal aberrations induced by radiation.
- 2B. What are acute radiation syndromes? Describe in detail any one of the syndromes.
- 2C. i) Explain the Sub-lethal and Potentially lethal damage
ii) Describe $LD_{50(30)}$

(10×3 = 30 marks)

3. Answer the following questions in detail:

- 3A. What are chemical radioprotectors? Describe in detail various types of radioprotectors and their mechanism of action.
- 3B. Write about the interaction of ionizing radiation with water molecule and the associated chain reactions.

(15×2 = 30 marks)

