

# MANIPAL UNIVERSITY

**SECOND SEMESTER M.Sc. MRP (2011 SCHEME)/M.Sc. HHIA (2011 & 2013 SCHEME)  
DEGREE EXAMINATION – JUNE 2014**

**SUBJECT: RESEARCH METHODOLOGY & BIO-STATISTICS/EPIDEMIOLOGY & BIostatISTICS**

Monday, June 16, 2014

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

✍ **Answer ALL the questions.**

1A. Compute the range and interquartile range for the following data.

Age in years: 35      45   38   32   41   48   36   34   46   39

1B. Distinguish between sampling and non-sampling errors.

(5+5 = 10 marks)

2A. Write a short note on binomial distribution.

2B. A research team wants to estimate the mean serum creatinine among men above 40 years of age in a rural village in Karnataka. A sample of 70 men above 40 years showed the mean serum creatinine as 98  $\mu\text{mol/l}$  with standard deviation of 12  $\mu\text{mol/l}$ . Find the 95% and 99% confidence intervals for mean serum creatinine in the study population. (The standard normal table values for 95% and 99% confidence levels are 1.96 and 2.58 respectively).

(5+5 = 10 marks)

3. Discuss paired t test and independent sample t test under the headings:- situations of use, example, assumptions and test statistic formula.

(10 marks)

4A. Enumerate the steps in testing of hypothesis.

4B. A team of cardiologists conducted a study to investigate the association between oral contraceptive use and hypertension. The results of the study are given below.

	Hypertensive	Normotensive	Total
Oral contraceptive	8	32	40
Other	15	45	60
Total	23	77	100

At 5% level of significance ( $\alpha$ ) do these data provide sufficient evidence to indicate the association between oral contraceptive use and hypertension? (The table value of Chi square for 5%  $\alpha$  and 1 degree of freedom is 3.84)

(5+5 = 10 marks)

5A. A study was planned to compare the left ventricular end diastolic volume between male and female healthy volunteers in the age group of 30-40 years. What is the minimum sample size required in each group if the investigators considered a difference of 8 mL as clinically significant with power of 80% and level of significance ( $\alpha$ ) of 5%? From a pilot study it was observed that the pooled standard deviation of left ventricular end diastolic volume was 16 mL. (The standard normal table value for 5%  $\alpha$  and 80% power is 1.96 and 0.84 respectively).

5B. What do you mean by a cohort study? Distinguish between prospective and historical cohort designs using a flow chart.

(5+5 = 10 marks)

6. What do you mean by randomization in RCTs? Explain the simple, block and stratified randomization methods.

(1+9 = 10 marks)

7A. In order to assess the validity of a diagnostic test, it was applied on 300 individuals with disease and 600 without disease. The test resulted in a positive diagnosis for 260 out of those with disease and 120 of those without disease. Construct appropriate  $2 \times 2$  table and calculate sensitivity, specificity, positive predictive value and negative predictive value of the test.

7B. Write a short note on stratified analysis.

(5+5 = 10 marks)

8. Explain the structure of a research protocol.

(10 marks)





**MANIPAL UNIVERSITY**

**SECOND SEMESTER M.Sc. MRP (2011 SCHEME)/M.Sc. HHIA (2011 & 2013 SCHEME)  
DEGREE EXAMINATION – JUNE 2014**

**SUBJECT: RESEARCH METHODOLOGY & BIO-STATISTICS/EPIDEMIOLOGY & BIostatISTICS**

Monday, June 16, 2014

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

☞ **Answer ALL the questions.**

1A. Compute the range and interquartile range for the following data.

Age in years: 35    45    38    32    41    48    36    34    46    39

1B. Distinguish between sampling and non-sampling errors.

(5+5 = 10 marks)

2A. Write a short note on binomial distribution.

2B. A research team wants to estimate the mean serum creatinine among men above 40 years of age in a rural village in Karnataka. A sample of 70 men above 40 years showed the mean serum creatinine as 98  $\mu\text{mol/l}$  with standard deviation of 12  $\mu\text{mol/l}$ . Find the 95% and 99% confidence intervals for mean serum creatinine in the study population. (The standard normal table values for 95% and 99% confidence levels are 1.96 and 2.58 respectively).

(5+5 = 10 marks)

3. Discuss paired t test and independent sample t test under the headings:- situations of use, example, assumptions and test statistic formula.

(10 marks)

4A. Enumerate the steps in testing of hypothesis.

4B. A team of cardiologists conducted a study to investigate the association between oral contraceptive use and hypertension. The results of the study are given below.

	Hypertensive	Normotensive	Total
Oral contraceptive	8	32	40
Other	15	45	60
Total	23	77	100

At 5% level of significance (los) do these data provide sufficient evidence to indicate the association between oral contraceptive use and hypertension? (The table value of Chi square for 5% los and 1 degree of freedom is 3.84)

(5+5 = 10 marks)

- 5A. A study was planned to compare the left ventricular end diastolic volume between male and female healthy volunteers in the age group of 30-40 years. What is the minimum sample size required in each group if the investigators considered a difference of 8 mL as clinically significant with power of 80% and level of significance ( $\alpha$ ) of 5%? From a pilot study it was observed that the pooled standard deviation of left ventricular end diastolic volume was 16 mL. (The standard normal table value for 5%  $\alpha$  and 80% power is 1.96 and 0.84 respectively).
- 5B. What do you mean by a cohort study? Distinguish between prospective and historical cohort designs using a flow chart.
- (5+5 = 10 marks)
6. What do you mean by randomization in RCTs? Explain the simple, block and stratified randomization methods.
- (1+9 = 10 marks)
- 7A. In order to assess the validity of a diagnostic test, it was applied on 300 individuals with disease and 600 without disease. The test resulted in a positive diagnosis for 260 out of those with disease and 120 of those without disease. Construct appropriate  $2 \times 2$  table and calculate sensitivity, specificity, positive predictive value and negative predictive value of the test.
- 7B. Write a short note on stratified analysis.
- (5+5 = 10 marks)
8. Explain the structure of a research protocol.
- (10 marks)





Reg. No.									
----------	--	--	--	--	--	--	--	--	--

## MANIPAL UNIVERSITY

### SECOND SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JUNE 2014

**SUBJECT: RADIATION PHYSICS, RADIATION QUANTITIES AND UNITS**

Wednesday, June 18, 2014

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

**Answer ALL the questions:**

1. Mention the main processes of interaction of X- rays and gamma rays with matter. Illustrate by means of a typical curve, the relative importance of these processes in different energy regions. How does the atomic cross section for these processes depend on the atomic number of the absorber?

(20 marks)

2A. Discuss about the classification neutron sources based on the energy.

2B. Discuss about the neutron cross sections.

(10+10 = 20 marks)

3A. Write short note on collisional losses and radiative losses.

3B. Discuss in detail protection quantities.

(10+10 = 20 marks)

**Answer the following:**

4. Write a short note on Bragg peak.

5. What is an exposure? Explain its measurement.

6. With the help of number – distance curve, define the quantities mean range, extrapolated range and straggling.

7. Discuss any five radioactive sources used in medical field.

(5 marks × 4 = 20 marks)



Reg. No.									
----------	--	--	--	--	--	--	--	--	--

## MANIPAL UNIVERSITY

### SECOND SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION– JUNE 2014

**SUBJECT: RADIATION SOURCES AND RADIATION GENERATING EQUIPMENTS**

Friday, June 20, 2014

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

**Answer ALL the questions.**

1. Discuss in detail the two types of X-ray production resulting from an electron beam with a given kinetic energy incident on a tungsten target.
2. Discuss in detail about the construction and working of Cyclotron. Also discuss the properties of the cyclotron produced radioisotopes.
3. Discuss the construction and working of a Linear Accelerator. Also sketch the treatment head and explain each part.

(20 marks × 3 = 60 marks)

**Answer the following questions:**

4. Describe the heel effect and discuss the factors that affect its importance in diagnostic radiology.
5. Discuss how the use of filters significantly reduces patient doses in diagnostic radiology.
6. Sketch an image intensifier tube and clearly label and discuss its components.
7. Discuss the principles of digital subtraction angiography.

(5 marks × 4 = 20 marks)



Reg. No.									
----------	--	--	--	--	--	--	--	--	--

# MANIPAL UNIVERSITY

## SECOND SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JUNE 2014

SUBJECT: RADIATION DETECTION, MEASUREMENT AND INSTRUMENTATION

Monday, June 23, 2014

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

✍ Answer ALL the questions.

1. What is personnel monitoring? Explain different types of personnel monitors.  
(20 marks)
  
- 2A. Explain with diagram the principle and working of Scintillation detectors.
- 2B. Discuss the applications of scintillation detectors.  
(10+10 = 20 marks)
  
- 3A. Explain in detail operating characteristics of a proportional counter.
- 3B. Explain any one application of proportional counter.  
(10+10 = 20 marks)
  
4. Write short notes on:
  - 4A. Multichannel Analyser
  - 4B. Fricke dosimeter
  - 4C. Radioisotope calibrator
  - 4D. Whole body counters

(5 marks × 4 = 20 marks)





Reg. No.

# MANIPAL UNIVERSITY

## SECOND SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE EXAMINATION – JUNE 2014

SUBJECT: RADIOBIOLOGY AND RADIOBIOLOGICAL BASIS OF RADIOTHERAPY

Wednesday, June 25, 2014

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

✍ Answer ALL the questions.

**1. Answer the following questions:**

- 1A. What are Radiosensitizers? Explain
- 1B. Add a note on Compton Effect.
- 1C. Explain Reoxygenation of tumors and its advantage in radiotherapy.
- 1D. Add a brief note on Bone Marrow syndrome.

(5 marks × 4 = 20 marks)

**2. Answer the following questions briefly:**

- 2A. Discuss the effect of radiation on Reproductive systems.
- 2B. What are the different types of ionizing radiation induced DNA damage? Explain
- 2C. Briefly discuss the prenatal effect of radiation exposure.

(10 marks × 3 = 30 marks)

**3. Answer the following questions in detail:**

- 3A. Describe radiation induced chromosomal aberrations with illustrated diagrams.
- 3B. What are free radicals? Describe in detail the direct and indirect effect of radiation in biological system.

(15 marks × 2 = 30 marks)

