

**MANIPAL UNIVERSITY****FIRST SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS)  
DEGREE EXAMINATION – JUNE 2016****SUBJECT: PAPER I: BASIC MEDICAL SCIENCES (ANATOMY & PHYSIOLOGY)**

Wednesday, June 15, 2016

Time: 10:00 – 13:00 Hrs.

Max. Marks: 60

- ✍ Answer both Section 'A' and 'B' in TWO Separate Answer Books.  
✍ Answer ALL questions. Draw diagrams wherever necessary.

**SECTION – A: ANATOMY: 40 MARKS**

1. Name the parts of gastrointestinal system. Describe the stomach in detail. (5+5 = 10 marks)
2. Write short notes on:
- 2A. Eyeball
  - 2B. Kidney
  - 2C. Right atrium
  - 2D. Spinal cord
  - 2E. Trachea
  - 2F. Ovary
- (5 marks × 6 = 30 marks)

**SECTION – B: PHYSIOLOGY: 20 MARKS**

1. Essay questions:
- 1A. Define blood pressure and give its normal value. Explain the regulation of blood pressure by baroreceptor mechanism.
  - 1B. Draw a neat labeled diagram of the neuromuscular junction. In the form of a flow chart describe the events that occur during neuromuscular transmission. (5 marks × 2 = 10 marks)
2. Write short answers for the following:
- 2A. List the four types of hypoxia
  - 2B. Write two differences between simple diffusion and facilitated diffusion
  - 2C. Mention the receptor for taste and smell
  - 2D. Name four muscle proteins
  - 2E. Define Landsteiner's law
- (2 marks × 5 = 10 marks)



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**FIRST SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE**  
**EXAMINATION – JUNE 2016**

**SUBJECT: PAPER III: ELECTRONICS**

Friday, June 17, 2016

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

- ✍ **Answer ALL the questions.**
- ✍ **Any missing data may be assumed suitably.**

**PART – A**

1. **Answer the following:**

- 1A. Differentiate active and passive elements with proper examples.
- 1B. Define Ohm's law and list the different types of distortion in amplifiers.
- 1C. Discuss the working of radiation thermometer.
- 1D. A germanium diode has a reverse saturation current of  $3\mu\text{A}$ . Calculate the voltage at which 1% of the rated current will flow through the diode, at room temperature ( $27^\circ\text{C}$ ) if diode is rated at 1A.
- 1E. Write a short note inverting and non inverting configuration of an op-amp.
- 1F. With proper diagram explain the working of AC voltmeter.
- 1G. Differentiate voltage and power amplifiers.
- 1H. List and explain the different parameters of FET.

(5 marks  $\times$  8 = 40 marks)

**PART – B**

2. **Answer the following:**

- 2A. Explain the working of piezoelectric force, strain and torque transducer.
- 2B. With proper circuit diagram and graphs explain input and output characteristics of transistor.
- 2C. Explain the working of transformer and RC coupling networks.
- 2D. With neat block diagram explain the working of microprocessor.
- 2E. Define cascading in amplifiers. Explain the working of differentiator using op-amp.

(8 marks  $\times$  5 = 40 marks)



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**FIRST SEMESTER M.Sc. (MEDICAL RADIATION PHYSICS) DEGREE**  
**EXAMINATION – JUNE 2016**  
**SUBJECT: PAPER IV: MODERN PHYSICS**

Monday, June 20, 2016

Time: 10:00 – 13:00 Hrs.

Max. Marks: 80

- ✍ **Answer ALL questions.**  
✍ **Any missing data may be assumed suitably.**

**Physical Constants:**

Speed of light in vacuum,  $c = 3 \times 10^8$  m/s      Planck's constant,  $h = 6.626 \times 10^{-34}$  Js  
Atomic mass unit,  $u = 1.67 \times 10^{-27}$  kg      Electron mass,  $m_e = 9.11 \times 10^{-31}$  kg

- 1A. Derive expressions for the De Broglie wavelength of an electron accelerated from rest through a potential of V volts considering both relativistic and non-relativistic cases.  
1B. State and prove Ehrenfest's theorem. (8+8 = 16 marks)
- 2A. Establish Schrodinger's equation for a particle in a potential well of infinite depth and solve it to obtain its energy levels.  
2B. Using Heisenberg's uncertainty principle prove that electron is not a constituent the Atomic nucleus.  
2C. What are 'eigen functions' and 'eigen values' of an operator? Verify which of the following functions:  
i)  $\sin 2x$   
ii)  $4 \cos 4x$  are the eigen functions of the operator  $P = (-\hbar^2 / dx^2)$ ? In each case state the eigen value. (8+3+5 = 16 marks)
- 3A. Discuss the salient features of *beta ray spectra* and explain how *Pauli's hypothesis of neutrino* emission solved the anomalies in the beta ray spectra. State the properties of neutrino.  
3B. What are mirror nuclei? Describe how the size of the nucleus can be determined using these types of nuclei. (8+8 = 16 marks)
- 4A. Give Yukawa's Meson theory of nuclear force. Explain how it explains the anomalous magnetic moment of the nucleons.  
4B. Describe the basic principles and operation of a Scintillation spectrometer. Explain its application to gamma ray spectrometry. (8+8 = 16 marks)
- 5A. Explain the major effects which influence the binding energy of the nucleus in the liquid drop model and hence derive semi - empirical binding energy formula.  
5B. Obtain the expression for the Q value of a nuclear reaction. Classify the nuclear reactions based on their Q value. (8+8 = 16 marks)

