Reg. No.									

MANIPAL UNIVERSITY

FIRST SEMESTER M.Sc. (RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2012

SUBJECT: BASIC MEDICAL SCIENCES (ANATOMY & PHYSIOLOGY)
(NEW REGULATION)

Monday, January 02, 2012

Time: 10:00 – 13:00 Hrs. Max. Marks: 50

- **Answer both Section 'A' and 'B' in TWO Separate Answer Books.**
- **Answer ALL questions.**

SECTION – A: ANATOMY: 25 MARKS

1. Classify synovial joints based on shape of articular surfaces with an example for each class. Describe the structure of a simple synovial joint.

(5+5 = 10 marks)

2. **Write short notes on the following**:

2A. Smooth muscle
2B. Internal ear
2C. Basal ganglia
2D. Stratified squamous non-keratinized epithelium
2E. Anatomical planes

(3×5 = 15 marks)

SECTION – B: PHYSIOLOGY: 25 MARKS

3. **Essay questions:**

3A. Draw a neat labeled diagram of an ECG from limb lead II. Mention the causes for different waves. Mention TWO uses of ECG.
3B. Classify the white blood cells. Mention their functions.
3C. Explain the mechanism of hydrochloric acid secretion in stomach.

(5×3 = 15 marks)

4. **Write short answers for the following:**

4A. Define facilitated diffusion. Give an example.
4B. List any TWO differences between skeletal muscle and smooth muscle.
4C. List any TWO clinical features of acromegaly.
4D. List any TWO functions of middle ear.
4E. Mention any TWO functions of cerebellum.

(2×5 = 10 marks)

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MANIPAL UNIVERSITY

FIRST SEMESTER M.Sc. (RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2012

SUBJECT: MATHEMATICAL METHODS IN PHYSICS

(COMMON FOR BOTH OLD AND NEW REGULATION)

Wednesday, January 04, 2012

Time: 10:00 – 13:00 Hrs. Max. Marks: 100

Answer ALL questions.

1. Define a one-one function and onto function. Find the graph of the function:

$$f(x)=\begin{cases} x, & 0 \le x < 1/2 \\ 1, & x = 1/2 \\ 1-x, & 1/2 < x \le 1 \end{cases}$$

(5 marks)

2. Show that $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^{x} = e$

(4 marks)

3. Evaluate:

$a)\ \lim_{x\to 0}\frac{1-\cos x}{x^2}$ $b)\ \lim_{x\to \pi/2}\frac{1-\sin x}{\pi/2 - x}$ $c)\ \lim_{x\to 0}(\cos x)^{1/x}$

(2+2+2 = 6 marks)

4. Find $\frac{dy}{dx}$ for the following:

$a)\ \log_e(\sec x+\tan x)$ $b)\ (\cot x)^{\sin x}+(\tan x)^{\cos x}$

$c)\ \sqrt{\frac{1-\tan x}{1+\tan x}}$ $d)\ \tan^{-1}\left[\frac{x}{\sqrt{1+x^2}}\right]$

(5+5+5+5 = 20 marks)

5. State and prove Lagranges mean value theorem. Apply Lagranges mean value theorem for $f(x)=e^x$ *in* $[0,1]$

(5 marks)

6. Evaluate:

$a)\ \int\frac{x+2}{x^2+2x+3}dx$ $b)\ \int_0^{\pi/2}\frac{dx}{5+4\cos x}$

$c)\ \int_0^{\pi/3}\frac{dx}{1-\sin x}$ $d)\ \int\frac{\operatorname{cosec}(\tan^{-1}x)}{1+x^2}dx$

(5+5+5+5 = 20 marks)

7. Uranium disintegrates at the rate proportional to the amount present at any instant. If m_1 and m_2 grams of Uranium are present at time t_1 and t_2 respectively, find half life of the uranium.

(4 marks)

8. In a condenser discharging electricity, the voltage 'v' satisfies the equation $k\left(dv/dt\right)+v=0$ where k is a constant and t is the time measured in seconds. Given k=50, find the time t in which v decreases to one tenth of its original value.

(4 marks)

9. Test for convergence or divergence of the following series:

$a)\sum \frac{4\cdot 7\cdot 10\cdot \ldots\ldots\ldots\ldots\ldots\cdot (3n+1)}{1\cdot 2\cdot 3\cdot \ldots\ldots\ldots\ldots\ldots\cdot n}x^n$

$b)\sum_{n=1}^{\infty}\frac{(n+1)^n}{(n)^{n+1}}x^n$

$c)1+\frac{2!}{2^2}+\frac{3!}{3^3}+\frac{4!}{4^4}+\frac{5!}{5^5}+\ldots\ldots\ldots\ldots$

(2+2+2 = 6 marks)

10. Solve the following:

$a)\left(x^2-yx^2\right)dy+\left(y^2+xy^2\right)ydx=0$

$b)\left(1+y^2\right)+\left(x-e^{-\tan^{-1}y}\right)\frac{dy}{dx}=0$

$c)\left(x+y^3\right)dx+2(x^2y^2+x+y^4)dy=0$

(3+3+3 = 9 marks)

11. From the following table find f(0.7):

x:	0.1	0.2	0.3	0.4	0.5	0.6
f(x):	2.68	3.04	3.38	3.68	3.96	4.21

(4 marks)

12. Using Newtons divided difference formula evaluate f(15) given

x:	4	5	7	10	11	13
f(x):	48	100	294	900	1210	2028

(4 marks)

13. Solve using Laplace transform $\frac{d^2y}{dt^2}+2\frac{dy}{dt}+5y=e^t\sin t \quad given \quad y(0)=0, y'(0)=1$

(5 marks)

14. Prove that $\int_0^{\infty}\frac{e^{-t}-e^{-3t}}{t}dt=\log 3$

(4 marks)

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FIRST SEMESTER M.Sc. (RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2012

SUBJECT: ELECTRONICS

(COMMON FOR BOTH OLD AND NEW REGULATION)

Friday, January 06, 2012

Time: 10:00 – 13:00 Hrs. Max. Marks: 80

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

PART – A

1A. With a neat energy band diagram explain the properties of conductors.

1B. State and explain ohm's law. What are its limitations?

1C. Explain electrons and holes of an intrinsic semiconductor.

1D. Explain Zener breakdown in a diode.

1E. Explain the construction and working of a Schottky diode. List its applications.

1F. Explain the construction and working of a junction transistor.

1G. Explain feedback amplifiers with a neat block diagram.

1H. Explain non-inverting amplifier using op-amp with a neat circuit diagram.

(5×8 = 40 marks)

PART – B

2A. A diode operating at 300K at a forward voltage of 0.4V carries a current of 10mA. When voltage is changed to 0.42V, the current becomes twice. Calculate the value of reverse saturation current and η (eta) for the diode.

2B. With a neat block diagram explain the working of spectrum analyzer.

2C. Two impedances (10+j12) Ω and (20-j15) Ω are connected in parallel and this combination is connected in series with an impedance (5-jX_C) Ω. Find the value of X_C, for which resonance occurs.

2D. Explain with a neat sketch, the internal block diagram of 555 IC. List its applications.

2E. Explain thermocoupled transducer. What are its applications?

(8×5 = 40 marks)

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MANIPAL UNIVERSITY

FIRST SEMESTER M.Sc. (RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2012

SUBJECT: ELECTRONICS

(COMMON FOR BOTH OLD AND NEW REGULATION)

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MANIPAL UNIVERSITY

FIRST SEMESTER M.Sc. (RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2012

SUBJECT: MODERN PHYSICS
(NEW REGULATION)

Monday, January 09, 2012

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 = 3.00×10^{8} m/s
Rest mass energy of the electron = 0.511eV
Planck's constant = 6.63×10^{-34} J s
Electron charge = 1.60×10^{-19} C
Electron mass = 9.11×10^{-31} kg
1eV = 1.60×10^{-19} J

1A. Derive Schrödinger's three dimensional time independent wave equation. Give the physical interpretation of wave function.

1B. What are matter waves? Show that De- Broglie wave group associated with a particle travels with a velocity equal to particle velocity.

(8+8 = 16 marks)

2A. What is Compton Effect? Derive an expression for the change in wavelength of scattered photon in Compton Effect.

2B. Briefly explain quantum mechanical tunneling.

2C. X rays of wavelength 0.2400 nm are Compton scattered and the scattered beam is observed at an angle of 60° relative to the incident beam. Find the wavelength and the energy of the scattered X rays.

(8+4+4 = 16 marks)

3A. What are mirror nuclei? How to estimate the size of the nucleus using mirror nuclei?

3B. Explain Yukawa's meson theory of nuclear force. Explain how it explains the anomalous magnetic moment of the nucleons.

(8+8 = 16 marks)

4A. Describe the construction and working of G M counter. Explain the terms:
i) Dead time ii) Recovery time iii) Quenching

4B. Describe the basic principles and operation of scintillation detector. Briefly explain working of NaI (Tl) scintillation detector.

(8+8 = 16 marks)

5A. On the basis of liquid drop model explain the factors influencing the binding energy of the nucleus.

5B. Use Uncertainty principle to prove the non-existence of electrons in the atomic nucleus.

5C. Explain the working of nuclear reactor.

(8+4+4 = 16 marks)

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FIRST SEMESTER M.Sc. (RADIATION PHYSICS) DEGREE EXAMINATION – JANUARY 2012

SUBJECT: FUNDAMENTALS OF COMPUTERS AND COMPUTER APPLICATIONS

(NEW REGULATION)

Wednesday, January 11, 2012

Time: 10:00 – 13:00 Hrs. Max. Marks: 80

Answer any FIVE full questions.

1A. Explain briefly the characteristics of computer.

1B. Briefly explain the First Generation computers listing out the salient features.

(8+8 = 16 marks)

2A. Give and explain the classification of computer systems.

2B. With a neat block diagram explain the different functional units of a digital computer and their interaction.

(8+8 = 16 marks)

3A. Represent the decimal numbers 0-15 in:

i) Binary ii) Hexadecimal number system

3B. Explain the hierarchy of computer memory.

(8+8 = 16 marks)

4A. List out the characteristics of Monitors. Also, give the classification of Monitors.

4B. Differentiate between:

i) System software and Application Software

ii) Compiler and Interpreter

(8+8 = 16 marks)

5A. Define Operating System. Explain briefly the different functions of Operating Systems.

5B. With a neat diagram, explain the different phases of compilation.

(8+8 = 16 marks)

6A. Explain briefly the ISO OSI Reference Model of Network Architecture.

6B. List and explain the advantages of using DBMS.

(8+8 = 16 marks)

7A. Write Short notes on:

i) Image Compression

ii) Optical Character Recognition

7B. Briefly explain the different control structures available in C language, with an example for each.

(8+8 = 16 marks)