NUCLEAR MEDICINE

PAPER-I

Time: 3 hours
Max. Marks:100

NM/D/20/24/I

Important Instructions:

- ***You are provided with 5 answer sheet booklets. Each individual answer sheet booklet consists of 10 pages excluding the covering jackets.***
- ***Answers to all the questions must be attempted within these 5 answer sheet booklets which must be later tagged together at the end of the exam.***
- ***No additional supplementary answer sheet booklet will be provided.***
- *Attempt all questions in order.*
- *Each question carries 10 marks.*
- *Read the question carefully and answer to the point neatly and legibly.*
- *Do not leave any blank pages between two answers.*
- *Indicate the question number correctly for the answer in the margin space.*
- *Answer all the parts of a single question together.*
- *Start the answer to a question on a fresh page or leave adequate space between two answers.*
- *Draw table/diagrams/flowcharts wherever appropriate.*

Write short notes on:

1. Enumerate different personal monitoring devices. Describe the working principle and different parts of a TLD. What is glow curve? 3+5+2

2. a) Define and describe with example: 2+2+2+4
   i. Isomeric transition.
   ii. Internal conversion.
   iii. Electron capture.
   b) Describe Bremsstrahlung radiation and factors affecting its production.

3. Describe briefly various challenges of attenuation correction in a PET/MR system and strategies to correct them. 5+5

4. Describe briefly filtered back projection and iterative reconstruction with schematics. What is 'time of flight' PET? 7+3

5. What are the types of Statistical Errors? Briefly describe sample size calculation for randomized control trial study. 4+6

6. a) Absorbed dose, equivalent dose and effective dose. (2+2+2)+(2+2)
   b) Radiation weighting factor and tissue weighting factor.

7. Describe interactions of radiation with matter and its application in Nuclear Medicine. 6+4

8. Derive decay equation. What are the different types of equilibrium achieved in a mixture of parent and daughter radionuclides? 5+5

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9. Define the following: 2+2+2+2+2
   a) Partial Volume Effect.
   b) Full Width at Half Maximum.
   c) Tenth Value Layer.
   d) Linear Energy Transfer.
   e) Branching Ratio.

10. Scintillation crystals used in PET system, compare the properties. 10

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