Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov/Dec– 2017**

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| **Code :** | **15PH3012** | **Duration :** | **3hrs** |
| **Sub. Name :** | **NUCLEAR AND PARTICLE PHYSICS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Elucidate the internal structure of a proton and a neutron. | CO1 | 4 |
| b. | Apply the schrodinger wave function to the problem of particle trapped inside an infinite potential well and obtain the eigen function and eigen values for a situation in which the particle wave function is not extending beyond the boundary. | CO1 | 16 |
| (OR) | | | | |
| 2. | a. | Consider an imaginary situation in which, the neutron mass is slightly lower than the mass of the proton. Write down the implications of such a scenario. | CO1 | 4 |
| b. | The nucleus is having many basic properties like nuclear mass, nuclear radius and so on. Explain any five of them with suitable examples. | CO1 | 16 |
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| 3. | a. | Discuss the failure of the liquid drop model of the nucleus briefly. | CO2 | 4 |
|  | b. | With the help of Wieszacker semi-empirical mass formula, prove the stability of a neutron star. | CO2 | 16 |
| (OR) | | | | |
| 4. | a. | Given that av = 15.5 MeV, as = 16.8 MeV, ac = 0.72 MeV, asym = 23 MeV, ap = 34 MeV. Calculate the binding energy (total) of an iron nucleus (). | CO2 | 4 |
|  | b. | From basic principles, construct Wieszacker semi-empirical mass formula. | CO2 | 16 |
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| 5. | a. | Complete the following equations. | CO3 | 4 |
|  | b. | Describe the process of alpha decay and explain in detail how alpha particles interact with matter. | CO3 | 16 |
| (OR) | | | | |
| 6. | a. | Illustrate the process of positron decay with suitable example. | CO3 | 4 |
|  | b. | Explain in detail about Fermi’s theory of inverse beta decay with necessary equations. | CO3 | 16 |
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| 7. | a. | The nuclear fusion reactors are hard to achieve because of some problems the scientists are facing. Explain in brief. | CO4 | 4 |
|  | b. | Write detailed notes about Indian 3 stage nuclear power programme. | CO4 | 16 |
| (OR) | | | | |
| 8. | a. | Given that the wave function of the neutron beam in neutron proton scattering is given by after the interaction. Find the value of the constant ‘k’ if the energy of the incoming neutron beam is around 10 MeV and the depth of the potential well of the scattering center is 36 MeV. Assume the reduced mass of the system is given by m = 0.835 x 10-27 kg. | CO4 | 4 |
|  | b. | With the help of Schrodinger time independent wave equation, enlighten on the process of low energy neutron-proton scattering. | CO4 | 16 |
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|  | | **Compulsory:** |  |  |
| 9. | a. | Discuss on the classification of fundamental particles briefly. | CO5 | 4 |
|  | b. | Classify the fundamental forces of nature and in detail, explain how they interact with ordinary matter. | CO5 | 16 |

ALL THE BEST