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Registration no: | | | | | | | | | | |

**Total Number of Pages: 2**

**M.Sc.**

**MPYC-205**

**2nd Semester Regular / Back Examination: 2016-17**
**Nuclear and Particle Physics**
**Branch: M.Sc.(AP)**
**Time: 3 Hours**
**Max marks: 70**

**Q Code:Z1162**

**Answer question no. 1, which is compulsory, and any five from the rest.**
The figures in the right hand margin indicate marks.

**Q.1. Answer the following questions:** **[2 x 10]**

**a)** What do you understand by elementary or fundamental particles?

**b)** Why a proton does not decay into a positron and a photon?

**c)** What are the fundamental differences between Baryons and Mesons?

**d)** Write the types of nuclear reaction?

**e)** What is nuclear fission? Give example.

**f)** State any two limitations of shell model of nuclear structure.

**g)** Define mass defect.

**h)** What is Parity? What do you mean by even and odd parity?

**i)** Write the properties of alpha decay.

**j)** Define Q-value of reaction.

**Q.2. (a)** Show how the concept of binding energy is related to the stability of atomic nucleus. **[5]**

**(b)** Calculate the binding energy and binding energy per nucleon in the case of $_{29}Cu^{64}$ whose mass is 63.9297 amu. Given $m_p$ = 1.007825 a.m.u. and $m_n$ = 1.008665 a.m.u. **[5]**

**Q.3. (a)** Explain liquid drop model of nucleus. Point out its usefulness and limitation in understanding the nuclear phenomena. **[7]**

**(b)** Write the features of nuclear shell model. **[3]**

**Q.4. (a)** Describe conservation laws in nuclear reaction. **[4]**

**(b)** Explain Gamow theory of alpha decay. **[6]**

**Q.5. (a)** Derive Breit Winger formula for nuclear reactions. **[6]**

**(b)** Derive a relation between mean life and radioactive constant. **[4]**

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**Q.6.** Describe the quark model of particle physics. Draw a diagram of lowest Baryon octet. Write its spin and parity. Label the particles with their charge (Q), isospin (I), third component of isospin ($I_3$), Strangeness (S), quark content and point the direction of increasing order of mass. **[10]**

**Q.7.** **(a)** What do you understand by elementary or fundamental particles? List all the fundamental particles with their charge and spin. **[5]**

**(b)** Describe the fundamental differences between leptons and mesons. **[5]**

**Q.8.** **Write short notes on any two:** **[5 X 2]**

**(a)** Quark Model

**(b)** Gell-Mann-Nishijima Scheme

**(c)** Beta decay

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