Name: **Enrolment No:**	

UPES

End Semester Examination, May 2024

Course: RELATIVITY AND COSMOLOGY — **Semester : VI**

Program: INTEGRATED B.SC-M.SC (PHYSICS) — **Time : 03 hrs.**

Course Code: PHYS 3037 — **Max. Marks: 100**

Instructions: ALL QUESTIONS IN SECTION ARE MANDATORY
QUESTION #9 AND #11 HAVE INTERNAL CHOICES

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Match the closest in the following: i. Galilean transformation — a. Non-inertial too ii. Special theory of relativity — b. space and time entwined iii. Lorentzian transformation — c. very high velocities iv. General theory of relativity — d. space and time absolute	**4**	**CO1**
Q 2	What are *time-like* and *space-like* vectors?	**4**	**CO3**
Q 3	What is a Euclidean space?	**4**	**CO2**
Q 4	When Ravish left on a long trip to a near-by star he was 20 years old. He clocked the trip as taking 5 years, but his twin, Rakesh, celebrated his 87^{th} birthday on the day Ravish came back. How fast did Ravish travel on this trip?	**4**	**CO1**
Q 5	Give a classification of Black holes.	**4**	**CO4**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	What are 4-vectors? Elaborate on Contravariant and Covariant vectors.	**4+6**	**CO2**
Q 7	The most accepted theory of our universe is the Big Bang theory. Elaborate on the role of CMB observations in validating the theory.	**10**	**CO5**
Q 8	What is the principle of equivalence in relativity? Appraise its significance in your own words.	**10**	**CO3**
Q 9	State and analyze the Steady State theory of our universe. OR Examine and describe 'Nucleosynthesis', i.e., the process of creation of nuclei beyond the lightest ones in our universe.	**10**	**CO4**

SECTION-C (2Qx20M=40 Marks)			
Q 10	Apprise the postulates of the Special Theory of Relativity (STR). Analyze and elaborate on the theory with the help of concepts of length contraction, time dilation, simultaneity etc. Are they real? Support your responses with observations.	**4+10+6**	**CO1**
Q 11	Stars are like living beings; they are born, they grow and evolve and they die! Considering the underlying principles of physics, create the entire life cycle of massive stars, those that lead to formation of neutron stars. OR What are low, medium and high mass stars? Create the life cycle of medium and low mass stars based on the underlying principles of physics.	**20**	**CO4**