


Name:			
Enrolment No:			
<b>UPES</b> <b>End Semester Examination, December 2024</b>			
<b>Course: Radiative Process in Astrophysics</b> <b>Program: B.Sc. Physics by Research</b> <b>Course Code: PHYS 4039P</b> <b>Instructions: Explain all the answers with appropriate diagrams.</b>		<b>Semester: 7<sup>th</sup></b> <b>Time : 03 hrs.</b> <b>Max. Marks: 100</b>	
<b>SECTION A</b> <b>(5Qx4M=20Marks)</b>			
S. No.		Marks	CO
Q 1	How do black hole form? Explain the classification of black holes in general relativity?	<b>4</b>	<b>CO4</b>
Q 2	Discuss the properties of the pulsar star with appropriate diagram.	<b>4</b>	<b>CO2</b>
Q 3	Explain how curvature of spacetime is related to the mass of a celestial object?	<b>4</b>	<b>CO4</b>
Q 4	Using Maxwell's equations derive the vector and scalar potential equations.	<b>4</b>	<b>CO1</b>
Q5	Estimate the age of a crab pulsar if its time period is 33 milliseconds and the time derivative of its time period is $10^{-12.4}$ ?	<b>4</b>	<b>CO3</b>
<b>SECTION B</b> <b>(4Qx10M= 40 Marks)</b>			
Q 6	Find the radius of carb pulsar star if its time period is 33 milliseconds.	<b>10</b>	<b>CO2</b>
Q 7	If a 10 solar mass black hole becomes a black hole, then find its effective size.	<b>10</b>	<b>CO4</b>
Q 8	Prove that the electromagnetic wave is transverse in nature.	<b>10</b>	<b>CO1</b>

Q 9	<p>What do you understand by the magnetic braking radiation? Explain the different characteristics of Magnetobremstrahlung.</p> <p style="text-align: center;">Or</p> <p>Discuss the self-absorption process of Synchrotron radiation and derive the Synchrotron power radiated by single electron.</p>	<b>10</b>	<b>CO3</b>
<p><b>SECTION-C</b> <b>(2Qx20M=40 Marks)</b></p>			
Q 10	<p>Find the radial equation of motion of test particle around a Schwarzschild black hole? Write the Schwarzschild black hole metric and discuss its event horizon? Find the radial equation of motion of test particle around a Schwarzschild black hole?</p> <p style="text-align: center;">Or</p> <p>Derive the spin down luminosity of a pulsar star and with the help of that find characteristic magnetic field.</p>	<b>20</b>	<b>CO4</b>
Q 11	<p>Explain the Faraday rotation effect and how Faraday rotation effect occurs in interstellar medium.</p>	<b>20</b>	<b>CO2</b>