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GIET UNIVERSITY, GUNUPUR – 765022
M. Sc. (Third Semester) Examinations, December – 2022
20PHPC301 – Relativistic Quantum Mechanics and Field Theory
(Physics)

Time: 3 hrs

Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A**(2 x 10 = 20 Marks)**

Q.1. Answer ALL Questions

	CO#	Blooms Level
a. Discuss the drawbacks of K.G equation?	CO1	K1
b. Discuss the concepts of Relativistic quantum mechanics?	CO1	K1
c. Discuss about the positive and negative energy states?	CO1	K1
d. Discuss the properties of gamma matrices matrices.	CO2	K1
e. Show that $\gamma_\mu\gamma_\nu + \gamma_\nu\gamma_\mu = 2\delta_{\mu\nu}$.	CO2	K2
f. Write short notes on 'Dirac Hole theory'?	CO2	K1
g. Differentiate between global and local symmetries?	CO3	K1
h. What are the different types of fields? Give examples?	CO3	K1
i. Explain Gauge invariance and charge conservation?	CO3	K1
j. What are the important steps towards field quantization?	CO4	K1

PART – B**(10 x 5 = 50 Marks)**Answer **ANY FIVE** questions

	Marks	CO#	Blooms Level
2. Derive the Klein-Gordan equation for a free particle?	10	CO1	K1
3. Derive Dirac equation for a free particle? Express Dirac equation in covariant form?	10	CO1	K1
4. Derive Dirac equation for a particle in a central force field and discuss about the spin of the particle?	10	CO2	K1
5. What is Spin orbit coupling? Derive the expression for the spin orbit interaction energy?	10	CO2	K1
6. What is a field? Formulate the Hamiltonian for the field? Derive the Poisson bracket formulation for the fields?	10	CO3	K1
7. Show that symmetry leads to a conservation using Noether's theorem? Discuss about the space time translation invariance?	10	CO3	K1
8. Derive the expression for the momentum in terms of creation, annihilation and number operators for charged meson field?	10	CO4	K1

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