

**B.Sc. 4<sup>th</sup> Semester (CBCS) Examination 2020**  
**Sir Gurudas Mahavidyalaya**  
**Physics -Honours**

**SUBJECT-PHSA**  
**FULL MARKS-45**

**PAPER: CC-8**  
**TIME- 2.00 hrs**

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**Theory Examination(25 Marks)**

Answer the following question any FIVE

**5X5=25**

1. Show that the function  $e^x(\cos y + i \sin y)$  is an analytic function, find its derivative. 3+2
  2. Show that the function  $x^2 - y^2 + 2y$  which is harmonic under the transformation  $Z = w^2$  2+3
  3. (a) Find the imaginary part of the analytic function whose real part is  $x^2 - 3xy^2 + 3x^2 - 3y^2$ . (b) An electrostatic field in the XY-plane is given by the positional function  $\phi = 3x^2y - y^3$ , find the stream function. 3+2
  4. Verify, Cauchy theorem by integrating  $e^{iz}$  along the boundary of the triangle with the vertices at the point  $1+i$ ,  $-1+i$ , and  $-1-i$ . (b) Define 'Limit of a function'. 4+1
  5. (a) Write down the outcome of Michelson's experiment. (b) Derive Lorentz-transformation equation. 2+3
  - 6 (a) Write down the basic postulate of relativity. Derive the equation how length contraction by Lorentz? 2+3
  7. (a) Show that the quantity  $dx dy dz dt$  remains invariant under Lorentz transformation. (b) What would be the accuracy of a clock if one wants to observe time dilation effect in the signal from an airplane travelling at a speed of 300m/s. 2+3
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### Practical Examination(15 Marks)

Answer the following question any **THREE**

**5X3=15**

- 1.(a)Define single-valued and multi-valued function. (b)Using Cauchy Integral Formula evaluate  $\oint \frac{e^{3iZ}}{(Z+\pi)^3} dZ$  where the circle  $|Z-\pi| = 3.2$  2+3
2. (a)State and prove Cauchy's integral theorem. 5
3. Find the value of  $C_1$  and  $C_2$  such that the function  $f(z) = x^2 + C_1y^2 - 2xy + i(C_2x^2 - y^2 + 2xy)$  is analytic. Also find  $f'(z)$ . 5
4. (a) Derive Einstein velocity addition theorem  $\beta_3 = \frac{\beta_1 + \beta_2}{1 + \beta_1\beta_2}$  where the symbols have their usual meaning. (b) Prove that speed of light is constant. 3+2
5. Derive the relativistic variation of mass with velocity. 5
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### Internal Examination(5 Marks)

Answer the following question any **ONE**

**5X1=5**

- 1(a) Derives the expression of relativistic relation between energy and momentum. (b) Show that K.E. reduced to  $T = \frac{1}{2}m_0v^2$  3+2
- 2(a) Find the velocity of electron whose K.E. is 0.25 MeV ,Rest mass of electron=0.150MeV. (b) Explain about mass less particle. 2+3