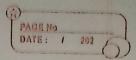
Pravega AstroWiz Solutions Q5- First option a) Let us say we project the satellite with speed V. wit ent Existent Rustum We want to pasy interpret the expression 12 (GMe+GMP) - 04 Let us find Gravitational potential energy due to interaction of satellite with plenet and Star PE = - : GMs - GMs If we naively equate this with initial KIS wer get the expression for speed This expression is obviously wrong because it does not take into account that planet we are projecting the satellite w.r.t which itself is moving. Another subble point is that it does not take into account change in Kinetic energy of Estitation plans t (This has been discussed precisely in next question)

b) Let us consider the expression we arrived at in a). How the speed obtained is expected to be wet Sun. If we want plants is speed to be minimum for East of France is must project it tangentially to Easth's plant's lated along it! Then we obtain the expression 12 Pame + 9 Mp). -V The flew here is that in clastic two books earlision (rather interaction) the energy (KE) exchanged is zero only in con from. If says one particle has extrainely large (Ke) change of harge mas is too in frame morty with large mass initially In frame of star, the exercise picks a now negligible amount of tinetic energy from I the KE initially supplied to I was selected to take into account the increase in planet Equally KE ( which is small compared to intial KE of eather Ngul compareble to

As argued in Q b) we must work in framles massive bodies to obtain correct result without accounting change in KE of maseive body. It can be seen that aravitational field due to star near la planets is for way less than due to planet Thus we make an assumption that satellite fixt escapes & planet's field and then the stores field. We must project The calculate tangentially
to planet's orbit along its and
velocity The binefit of this is when we change out forme to star we add the planets · Estates exced to remnant spied of of satellile ( wit planet) . Had live drection in would have got the two vectors at same angle, thus leading to none maximum desitant velocity



- 16.49 km/s

d) We assume that satellite first escapes planets field and then escapes you's field.

Say we project the satellite wit Booten planet with speed & along its tangent of planet's pobil. thing Energy conservations (in frame of planet) The greed of greateful affer it cropes the planet's field is 14-29Mp. Now to get the speed wit Star we add the oskital greed of planet. Reason for this is that the fivo would be demost along same line since we projected the satellite tangentially West Star speed is 11 V2 29Mp + Vo Now wet Star , This salellite must escape the Gravitational field of star it must How distance of satellite is almost R from star.
This is because gravitational field of splanet is egrificant in much emaller region Chan that of star. -! By anergy consumation 2 m (12-29h, 0f V) = 9Mc m