102 # The Islamia university of Bahawalpur I-A/19

B.Sc. Physics NEW Maximum Marks: 40

Paper: I (Mechanics) Max. Time Allowed: 3 Hrs.

Sr. No.	Note: Question 1 is compulsory. Attempt any TWO questions from SECTION II and SECTION III each.	Marks
	SECTION I	
Q. No. 1	Attempt any four parts from this question a) Can scalar product be negative quantity? b) How would you design a recoilless gun? c) Why is there virtually no atmosphere on the moon? d) Explain why one could lie on the bed of nails without pain? e) The mass of the electron is 0.511 MeV. What does this statement mean?	2x4=8
	SECTION II	
Q. No. 2	(a) State and prove Gauss's divergence theorem. (b) Define work-energy theorem. Prove the $W_{net}=\frac{1}{2}mv_f^2-\frac{1}{2}mv_i^2$.	4 4
Q. No. 3	(a) State and prove law of orbits of planetary motion. (b) Derive the Einstein mass energy equation $E=mc^2$.	4 4
Q. No. 4	(a) Define center of mass and derive the equation of Net. External force of two Particles system. (b) Define elastic and inelastic collision also prove that speed of approach is equal to speed of separation.	4 4
	SECTION III	
Q. No. 5	(a) If $\vec{A}=x^2z\,\hat{i}-2y^3z\,\hat{j}+xy^2z\,\hat{k}$ find the $\nabla.\vec{A}$ at (1, −1,1)? (b) A conduction electron in copper near the absolute zero of temperature has kinetic energy of 4.2eV. What is speed of the electron?	4 4
Q. No. 6	(a) A 5.18 g bullet moving at 672 m/s Strikes a 715g wooden block at rest on a Frictionless surface. The bullet emerges with its speed reduced to 428 m/s. Find the resulting speed of the block? (b)Calculate the rotational inertia of a meter stick of mass 0.56 kg about an axis perpendicular to the stick and located at 20 cm mark?	4 4
Q. No. 7	(a) A satellite orbits at a height of h= 230 km above the earth surface. What is The period of the satellite? ($R_E = 6370\ km$). (b) Estimate the density of the red wine that Pascal used in his 14 m long barometer. Assume that the wine filled the tube.	4 4
Q. No. 8	(a) The Windows in an office building are 4.26 m by 5.26 m. On a stormy day air Is blowing at 28.0 m/s past a window on the 53rd floor. Calculate the net Force on the window the density of the air is 1.23kg/m^3. (b) What is the momentum of a proton at a speed of v=0.86c?	4 4