FEDERAL PUBLIC SERVICE COMMISSIO

COMPETITIVE EXAMINATION FOR RECRUITMENT TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT, 2012

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PHYSICS, PAPER-I

TIME ALLOWED:	**(PART-I MCQs)**	**30 MINUTES**	**MAXIMUM MARKS: 20**
THREE HOURS	**(PART-II)**	**2 HOURS & 30 MINUTES**	**MAXIMUM MARKS: 80**

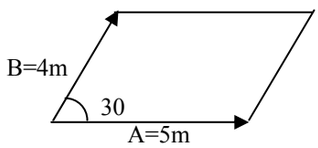
NOTE: **(i)** Candidate must write **Q. No.** in the **Answer Book** in accordance with **Q. No.** in the **Q. Paper.**
(ii) Attempt **ONLY FOUR** questions. **ALL** questions carry **EQUAL** marks.
(iii) Extra attempt of any question or any part of the attempted question will not be considered.
(iv) **Use of Scientific Calculator is allowed.**

PART-II

Q. 2. **(a)** A vector is given by R=2i + j + 3k. Find
(i) the magnitude of 'x', 'y' and 'z' components.
(ii) the magnitude of 'R'.
(iii) the angle between 'R' and 'x', 'y' and 'z' axis. **(3,3,3)**

(b) Vectors 'A' and 'B' have equal magnitude of 5.0. If the sum of 'A' and 'B' is the vector 6j. Find the angle between 'A' and 'B'. **(6)**

(c) Find the area of the parallelogram shown with vectors 'A' and 'B'. **(5)**



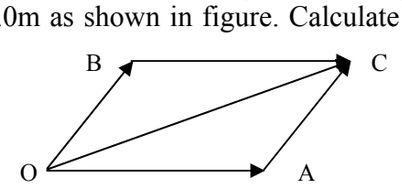
Q. 3. **(a)** State Hook's Law. A mass attached to an elastic spring is displaced from its equilibrium position and released. Show that its motion is simple harmonic and derive the differential equation, relation for instantaneous velocity, displacement and acceleration and plot each quantity with time for such motion. **(1,1,2,3,3)**

(b) A block of unknown mass is attached with an elastic spring having spring constant 6.5N/m and undergoes simple harmonic motion with an amplitude of 10 cm. When the block is half way between its equilibrium position and end point, its speed is 30cm/sec. Find
(i) Mass of the block (ii) Time period of the system
(iii) Maximum acceleration of the block **(2,3,3)**

(c) A mass spring system is in an elevator which moves upward with an acceleration "a". What will be the effect on measured value of spring constant compared to its value when elevator is at rest. **(2)**

Q. 4. **(a)** What are conservative and non-conservative forces? Give two examples of each. Prove mathematically that work done round a closed path in conservative field is zero. **(2,2,6)**

(b) A force acting on a particle moving in XY plane is given by $F=(2yi + x^2j)N$, where x and y are in meters. Particle moves from origin to a final position having coordinates x = 5.0m and y = 5.0m as shown in figure. Calculate the work done by the force F along
(i) Path OAC
(ii) Path OBC
(iii) Path OC
(iv) Is force F is conservative **(2,2,2.2)**

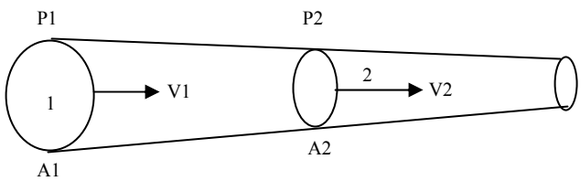


(c) Name various forces of nature **(2)**

PHYSICS, PAPER-I

Q. 5. **(a)** Differentiate between Laminar and Turbulent flow. Derive Bernoulli's equation for an incompressible and non-viscous fluid flowing through a non-uniform pipe and show that the sum of pressure, Kinetic energy per unit mass and potential energy per unit mass at one point is the same as the sum of these quantities at another point with different cross-sectional area. **(2,5,3)**

(b) A horizontal constricted pipe as shown in figure **(8)**



is called a Venturi Tube and can be used to measure the flow speed of an incompressible fluid. Derive the relation for flow speed at point (2) if pressure difference (P_1-P_2) is known.

(c) Why the speed of water in the middle of smooth flowing stream is high than its speed on the sides. **(2)**

Q. 6. **(a)** What is moment of Inertia? A rigid body of mass "M" is rotating with angular velocity 'ω'. Derive the relation for rotational kinetic energy of the body in terms of moment of inertia. **(2,8)**

(b) Prove that the moment of inertia of a uniform rod of length "L" and mass "M" about an axis passing through its centre is $I=ML^2/12$. **(8)**

(c) Differentiate the amount of energy of a bullet fired by a gun and a rifle with same linear velocity. **(2)**

Q. 7. **(a)** Differentiate between the special and general theory of relativity. Write the basic postulates of special theory of relativity. **(2,4)**

(b) An event occurs at a point (x,y,z) at time "t" in a frame of reference "S". Using Lorentz Transformation, derive the coordinate (x', y', z') and "t'" of the event observed in a frame "S′"moving relative to "S" with a constant speed "U" in positive X-direction. **(10)**

(c) Differentiate between Inertial and Non-Inertial Frames of reference. **(4)**

Q. 8. Write short notes on any TWO of the following: **(10,10)**

(a) Interference of light and Young's Double Slit experiment.
(b) LASER, its production and applications.
(c) Second Law of Thermodynamics and its applications.

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