



Solid Mechanics and Hydraulic Machines
(EEE)

Maximum Marks: 60

Date: 18.07.2024 Duration: 3 hours

- Note:**
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A		CO	Bloom Tx
All the following questions carry equal marks (10 X 1M=10 Marks)			
1.a)	Give the laws of dynamic friction.	1	I
b)	List the conditions for equilibrium of a body acted upon by a system of forces in two dimensions.	1	I
c)	State the perpendicular axis theorem as applied to moment of inertia.	2	I
d)	Give the expression showing the relationship between elastic moduli (E,C,K).	2	II
e)	Compare Kinetics and Kinematics.	3	II
f)	Write the work-energy equation and mention its application.	3	I
g)	What is hydroelectric power plant?	4	I
h)	What is the purpose of drawing a velocity triangle?	4	I
i)	Write the function of draft tube.	5	I
j)	Define specific speed of a turbine	5	I
Part-B			
Answer All the following questions. (5 X 10M=50Marks)			
2	A. Classify the various kinds of system of forces with illustrative sketches. (5) B. Concurrent forces 3P, 7P and 5P act respectively along three directions, which are parallel to the side of an equilateral triangle taken in order. Determine the magnitude and direction of the resultant. (5)	1	IV
OR			
3	A. State and describe the principle of parallelogram law of forces. (3) B. Determine the reactions at the supports of the given beam. (7)	1	IV
4	Write different types of Beams with a neat sketch and also write the types of loads. (10)	2	V
OR			

5	A concrete column of cross-sectional area $400 \text{ mm} \times 400 \text{ mm}$ is reinforced by four longitudinal, each 48 mm diameter, round steel bars placed at each corner. If the column carries a compressive load of 280 kN , determine: (i) Loads carried by concrete and steel bar (ii) Compressive stress produced in the concrete and steel bars, if the Young's modulus of elasticity of steel is 15 times that of concrete. (10)	2	IV
6	A body moving with uniform acceleration observed to travel 33 m in 8th second and 53 m in 13 second of its travel. Calculate the velocity at start and uniform acceleration. (10)	3	IV
OR			
7	A. State and prove the law of conservation of energy (5) B. Write impulse momentum equation (5)	3	IV
8	A jet of water strikes a stationery curved plate tangentially at one end at an angle of 30° . The jet of 75 mm diameter has a velocity of 30 m/s . The jet leaves at the other end at angle of 20° to the horizontal. Determine the magnitude of force exerted along 'x' and 'y' directions. (10)	4	IV
OR			
9	Discuss the layout of a typical hydroelectric power plant and describe it's working. (10)	4	III
10	Give a detailed account of the design aspects and working of a Pelton wheel turbine with a neat sketch. (10)	5	III
OR			
11	Discuss the components and working of a two stage reciprocating pump with a neat sketch. (10)	5	III