R22

ANURAG Engineering College
(An Autonomous Institution)
II B.Tech II Semester Regular Examinations, June/July – 2024
### SOLID MECHANICS & HYDRAULIC MACHINES
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3 Hours   **Max. Marks: 60**

Section – A (Short Answer type questions)   (10 Marks)
Answer All Questions

		Course Outcome	B.T Level	Marks
1.	Define the terms: i) Friction; ii) Coefficient of friction	CO1	L1	1M
2.	State the necessary and sufficient conditions of equilibrium for a coplanar force system.	CO1	L1	1M
3.	What is the poissons ratio of steel?	CO2	L1	1M
4.	What are the different types of elastic constants?	CO2	L1	1M
5.	State the D'Alembert's principle for a particle.	CO3	L1	1M
6.	What is work-energy principle for rotation bodies?	CO3	L2	1M
7.	What is hydrodynamic force?	CO4	L2	1M
8.	What is water hammer?	CO4	L1	1M
9.	List out the losses in pumps.	CO5	L1	1M
10.	Name the parts of centrifugal pump.	CO5	L1	1M

Section B (Essay Questions)
Answer all questions, each question carries equal marks.   **(5 X 10M = 50M)**

			Course Outcome	B.T Level	Marks
11.	A)	Three cylinders are placed in a rectangular ditch as shown in Figure. Neglecting friction, determine the reaction between cylinder A and the vertical wall. Weights of cylinders A, B, C are 75 N, 200 N, 100N and Radius is 100 mm, 150 mm, 125 mm respectively.	CO1	L2	10M

OR
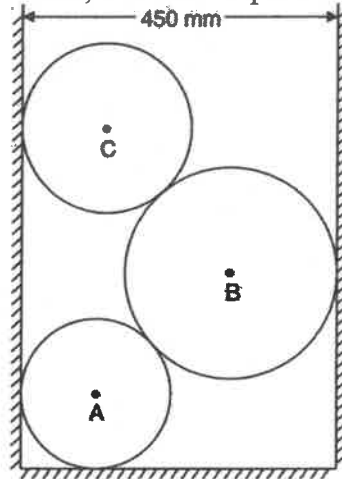
			Course Outcome	B.T Level	Marks
	B)	i) Classify different system of forces with suitable examples.	CO1	L2	4M
		ii) Two forces of 80N and 70N act simultaneously at a point. Find the resultant force, if the angle between them is 150^0.			6M
12.	A)	i) Draw stress - strain diagram for mild steel. Indicate salient points and define them.	CO2	L2	5M
		ii) Derive relation between three elastic moduli.			5M

OR

B) Discuss about the expression for finding mass moment of inertia of a cylinder of radius **R** and height **h** about its base.   CO2   L2   10M

13. A) The road roller has a total mass of 12,000kg. The front roller has a mass of 2000kg, a radius of gyration of 0.4m and a diameter of 1.2m. The rear axle together with its wheels has a mass of 2500kg, a radius of gyration of 0.6m and a diameter of 1.5m. Calculate the kinetic energy of rotation of the wheels and axle at a speed of 9km/h and total kinetic energy of the road roller.   CO3   L3   10M

OR

B) A bullet of 25 g mass is fired with a speed of 400 m/s. What is its kinetic energy? If the bullet can penetrate 20 cm in a block of wood, what is the average resistance of the wood? If the bullet were fired into a similar block of 10 cm thick wood, what would be the exit speed?   CO3   L3   10M

14. A) i) A jet of water 80 mm diameter and having a velocity of 20 m/s impinges at the centre of hemispherical vane. The linear velocity of vane is 10 m/s in the direction of jet. Find the force exerted on the vane.   CO4   L3   5M
ii) Derive an expression for the force exerted by a jet of water striking on curved vane tangentially at one tip and leaving at the other end.   5M

OR

B) i) Define the term 'impact of jets'. Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet.   CO4   L3   5M
ii) Find the force exerted by a jet of water of diameter 100mm on a stationary flat plate, when the jet strikes the plate normally with a velocity of 30m/sec.   5M

15. A) i) Draw the velocity triangle for Pelton wheel, Francis turbine and Kaplan turbine.   CO5   L3   5M
ii) Sketch the different types of draft tubes? Give the formula for efficiency of it.   5M

OR

B) i) Explain the principle and working of a Centrifugal pump with a neat sketch.   CO5   L3   4M
ii) A centrifugal pump delivers water against a net head of 14.5m and design speed of 1000 rpm. The vanes are curved back to an angle of 30^0 with periphery. The impeller diameter is 300 mm and outlet width 50 mm. Determine the discharge of the pump if the manometric efficiency is 95%.   6M