Shirpur Education Society's

R. C. PATEL INSTITUTE OF TECHNOLOGY, SHIRPUR

An Autonomous Institute

(Affiliated to Dr. Babasaheb Ambedkar Technological University, Lonere)

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(स्वायत्त महाविद्यालय)

A.Y. 2023-24-Year-1/Semester-II

Program: FYBTECH (GROUP B)

Course: **COMPUTATIONAL ENGINEERING MECHANICS (22ESFY2040T)**

Date: 3/08/2024

Max Marks: 65

Time: 9 TO 11 AM

Duration: 2 Hrs

RE END SEMESTER EXAMINATION EVEN SEM- II – 2023-24 (OLD)

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.

(1) This question paper contains 04 pages.

(2) All Questions are Compulsory.

(3) Answer to each new question is to be started on a fresh page.

(4) Figures in the brackets on the right indicate full marks.

(5) Assume suitable data wherever required, but justify it.

(6) Support your answers with neat labelled diagrams, wherever necessary.

Question No.		Max. Marks
Q1	A. Determine resultant in magnitude and direction of force system shown in Fig.1	[06]

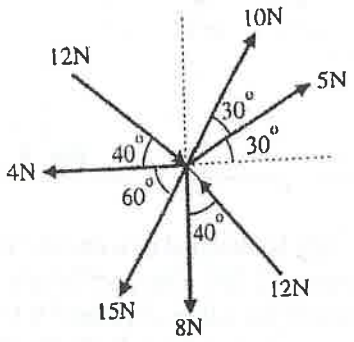


Fig. 1

B. Calculate the support reactions for the beam shown in Fig. 2. [07]

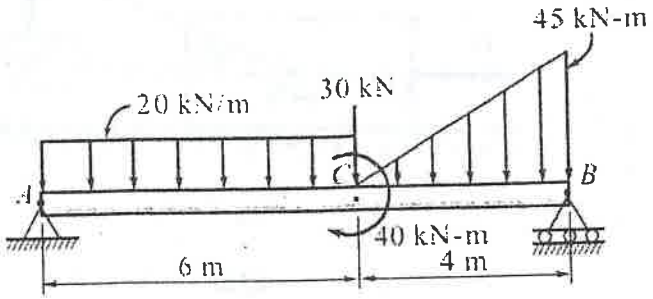


Fig. 2

C. Three forces of 2P, 3P and 4P act along the three sides of an equilateral triangle of side 100 mm taken in order as shown in Fig. 3. Find the magnitude and position (perpendicular distance) of the resultant force. [07]

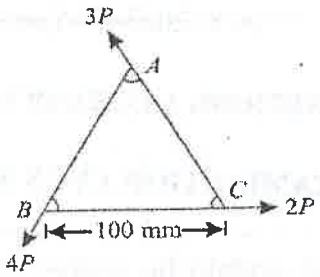
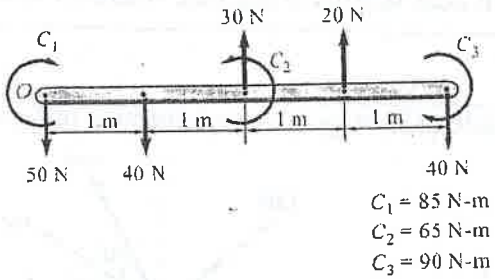


Fig. 3

OR

C. Replace the force system acting on a bar as shown in Fig. 4 by a single force at point 'O'. [07]



$C_1 = 85$ N-m
$C_2 = 65$ N-m
$C_3 = 90$ N-m

Fig. 4

Q2

A. A block weighing 5 kN is attached to a chord, which passes over a frictionless pulley, and supports a weight of 2 kN. The coefficient of friction between the block and the floor is 0.35. Determine the value of force P if (i) the motion is impending to the right (ii) the motion is impending to the left. Refer Fig. 5. [08]

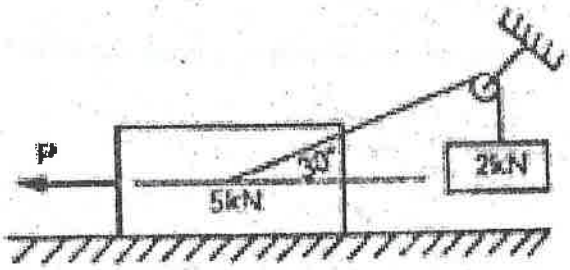
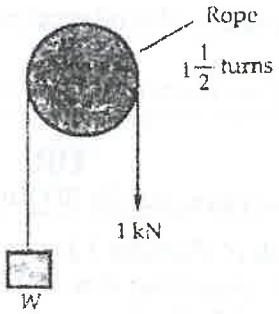
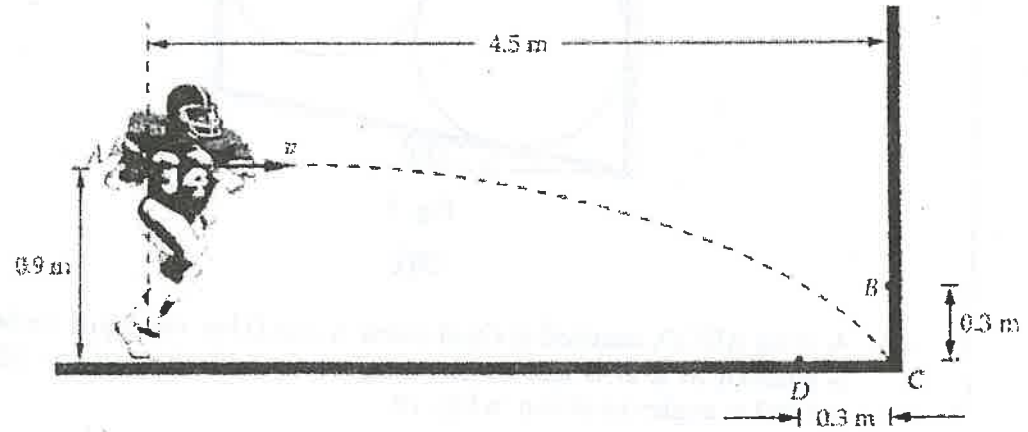
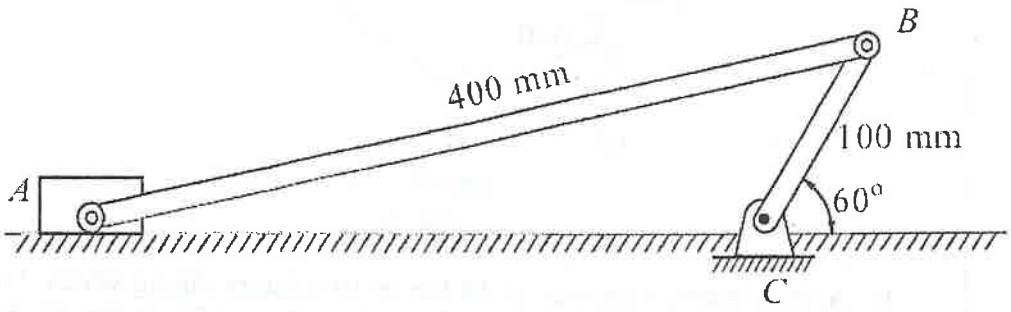
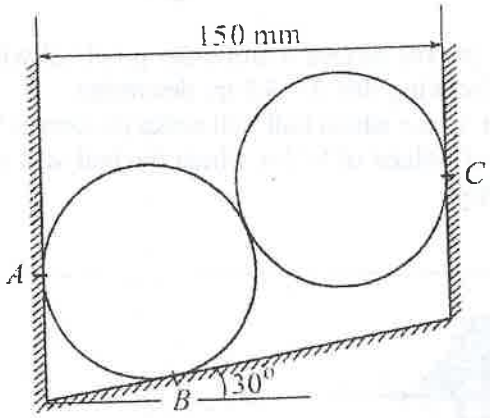
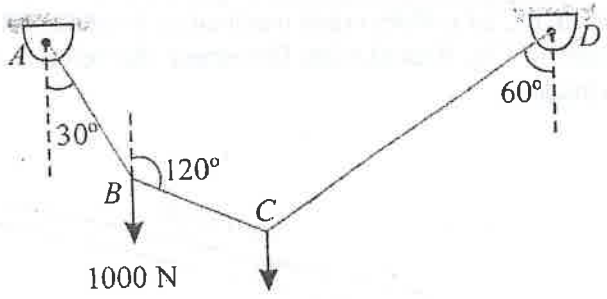


Fig. 5

OR

	A. A rope makes 1.5 turns over a fixed cylinder as shown in Fig. 6. Angle of friction between rope and cylinder is 10°. Find range of values of 'W' that can be kept in equilibrium by 1 kN force. State the condition of impending motion in each case.  Fig. 6	[08]
	B. A handball player throws a ball from point 'A' with a velocity 'v' in horizontal direction. Knowing that d = 4.5 m, determine i) The value of 'v' for which ball will strike the corner 'C'. ii) The range of values of 'v' for which the ball will strike the corner region BCD. Refer fig. 7 below  Fig. 7	[07]
Q3	**A.** The crank BC of a slider crank mechanism is rotating at constant speed of 30 rpm, as shown in Fig. 8 clockwise. Determine the velocity of the cross head A at the given instant.  Fig. 8	[08]

	OR A. A car starts from rest on circular curve of radius 250m and accelerates at a constant tangential acceleration of 1.2m/sec^2. Determine the distance travelled and time taken when the magnitude of total acceleration is 1.5m/sec^2.	[08]
	B. Perform a 45° rotation of triangle, A (0, 0), B (1, 1), C (5, 2) about the origin.	[07]
	OR B. Explain (i) 3D Translation and (ii) 3D Rotation	[07]
Q4	A. Two cylinders each of diameter 100 mm and each weighing 200 N are placed as shown in Fig. 9. Assuming that all the contact surfaces are smooth, find the reactions at A, B and C. The base line inclined at 30° to horizontal.  Fig. 9	[08]
	OR	
	A. A string ABCD, attached to fixed points A and D has two equal weihts of 1000 N attached to it at B and C. The weights rest with the portions AB and CD inclined at angles as shown in Fig. 10.  Fig. 10	[08]
	B. A train makes a journey of 15 km in 10 minutes during which it accelerates uniformly in first 30 seconds and retards uniformly for the last 60 seconds. For the remaining period, it travel with uniform velocity. (i) Sketch the V-T diagram, (ii) Find the uniform velocity (iii) find the acceleration and retardation.	[07]