



C20-A-105

7006

**BOARD DIPLOMA EXAMINATION, (C-20)
OCTOBER/NOVEMBER—2023
DAE – FIRST YEAR EXAMINATION
ENGINEERING MECHANICS**

Time : 3 Hours]

[Total Marks : 80

PART—A

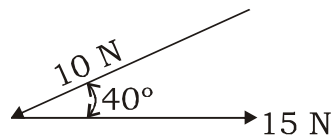
3×10=30

- Instructions :** (1) Answer **all** questions.
(2) Each question carries **three** marks.
(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. State Lami's theorem and express it mathematically.
2. Define equilibrium and equilibrant.
3. Define dynamic friction.
4. Define simple machine and write its applications.
5. Define velocity ratio and mechanical advantage.
6. Define higher pair and lower pair.
7. Define kinematic chain.
8. Write inversions of slider crank chain.
9. Write advantages and disadvantages of chain drive over belt drive.
10. Write the use of Jockey pulley.

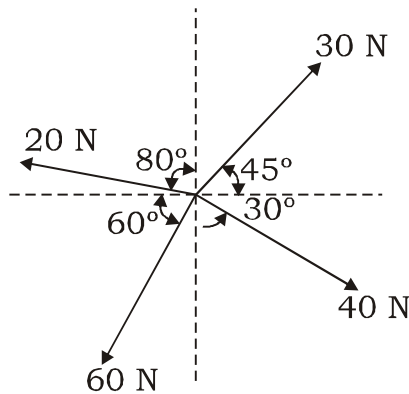
- Instructions :** (1) Answer **all** questions.
 (2) Each question carries **eight** marks.
 (3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. (a) Find the magnitude and direction of the resultant of two forces acting as shown in fig.



(OR)

- (b) Find the magnitude and direction of the resultant of the force system shown in fig.



12. (a) A body weighing 400 N is pushed by a force of 100 N on a rough horizontal plane. If the line of action of push is 30° with horizontal, find the coefficient of friction.

(OR)

- (b) A load of 3000 N is to be raised by a screw jack, with a screw of 85 mm mean diameter and pitch of 12 mm. Find the efficiency of screw jack, if the coefficient of friction is 0.075.

13. (a) The velocity ratio of a lifting machine is 20. The initial frictional resistance is 30 N and increases uniformly at the rate of 0.016 N per Newton load. Find the effort required to lift a load of 5800 N and the efficiency at this load.

(OR)

(b) In a differential pulley block, the number of teeth on larger and smaller pulleys are 15 and 14 respectively. Find the effort needed to raise a weight of 280 N, assuming the efficiency is 75%.

14. (a) A gear drive comprises 2 involute gears is to have a speed reduction of 2 : 1. The driving pinion has 45 teeth and revolves at 200 rpm. Determine the speed and number of teeth of the driven gear.

(OR)

(b) Find the power transmitted by a belt running over a pulley 600 mm diameter at 130 rpm. Coefficient of friction between pulley and belt is 0.25. Angle of lap is 180° and maximum tension in the belt is 3 kN.

15. (a) An engine running at 150 rpm is required to drive a machine by means of a belt. The pulley on the engine shaft is of 3 m diameter and that of the machine shaft is of 2.5 m diameter. If the belt thickness is 5 mm, find the speed of the machine shaft when

- (i) there is no slip
- (ii) there is a slip of 5%

(OR)

(b) Find the length of the open belt to drive a pulley of 90 cm diameter at a distance of 14 m from the driving pulley of diameter 490 cm. And also find the angle of contact.

PART—C

10×1=10

- Instructions :**
- (1) Answer the following question.
 - (2) The question carries **ten** marks.
 - (3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16. An effort of 320 N is required to lift 10,000 N and effort of 600 N is required to lift 19,850 N using a simple machine. Find the load lifted using an effort of 160 N on that machine.

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