U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E.   **Semester: I / II**
Branch: Common to all Branches   **Duration: 3 hrs.**
Course Code: 18CV1ESENM / 18CV2ESENM   **Max Marks: 100**
Course: Engineering Mechanics   **Date: 15.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
                       2. Missing data, if any, may be suitably assumed.

UNIT - I

1   a)   With neat sketches explain the classification of force systems.   **05**

    b)   The resultant of two forces is 400 N. If the forces are inclined at 40^0 and 60^0 **06**
         with the resultant one on either side, calculate the magnitude of the two forces.
         Solving using Triangle law of forces.

    c)   Two flower pots, shown in FigQ1 (c) are supported with steel wires of equal   **09**
         diameter. Pot A weighs 10 N and pot B weighs 8 N. Determine the forces in
         the different portions of steel wire.
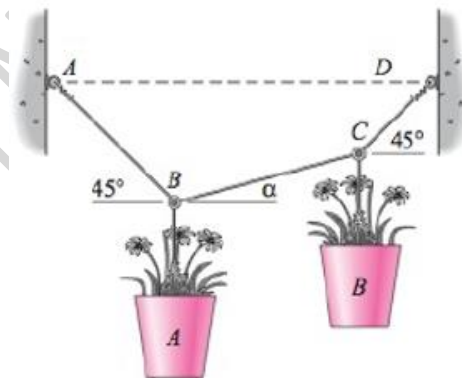
FigQ1(c)

OR

2   a)   A commercial air liner with four jet engines each with a forward thrust of 90   **07**
         KN of   is in a steady, level cruse, when the engine number 3 suddenly fails.
         Determine and locate the resultant of the three remaining engine forces with
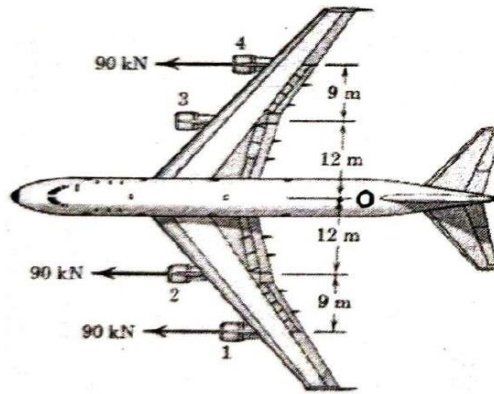   respect to 'O' Refer Fig Q 2 (a)

Fig Q 2 (a)

b) A set of forces act on the section of a gravity dam as shown in Fig.Q2(b). Determine the resultant of the forces and locate its intersection with the base AB. For a safe design this intersection should occur within the middle third. of the base. Does it? **09**

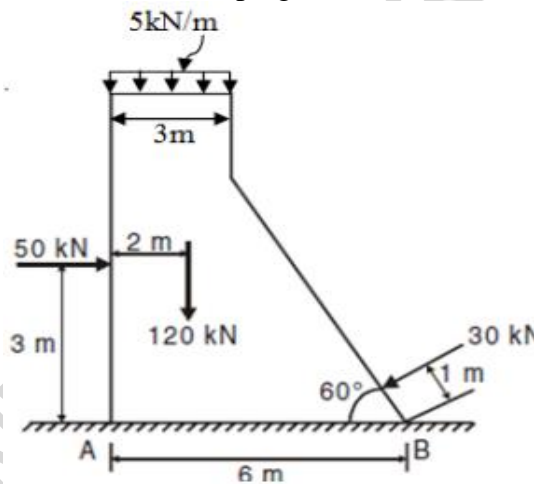Note: 30 KN force acts normal to the sloping face of dam
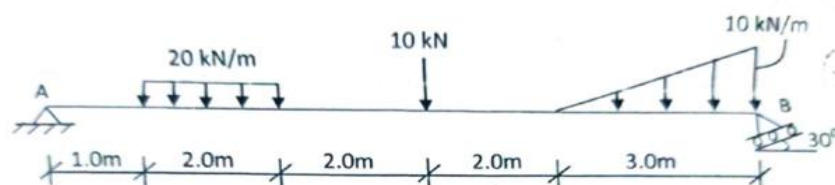

Fig.6

Fig Q2 (b)

c) List the characteristics of a couple. **04**

UNIT - II

3 a) Determine the reactions at the supports for the beam shown in FigQ3(a). **08**

FigQ3(a)

b) Analyse the pin jointed plane frame shown in Fig Q3 (b) using method of joints and tabulate the results. **12**
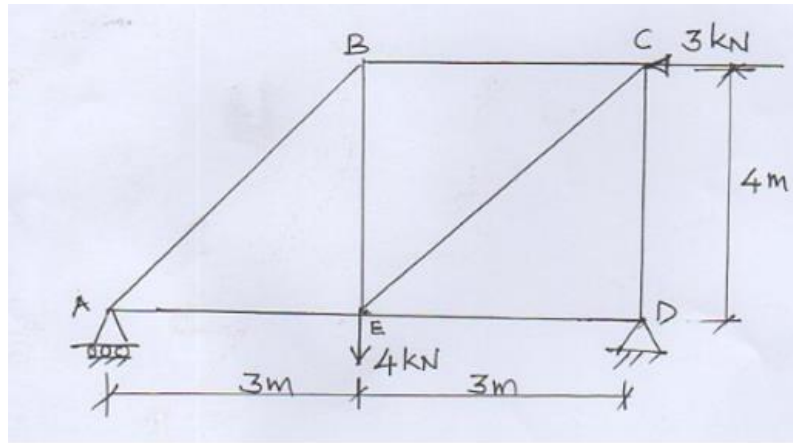
Fig Q3 (b)

UNIT - III

4 a) Locate the centroid of the shaded area shown in Fig Q4 (a)   **10**
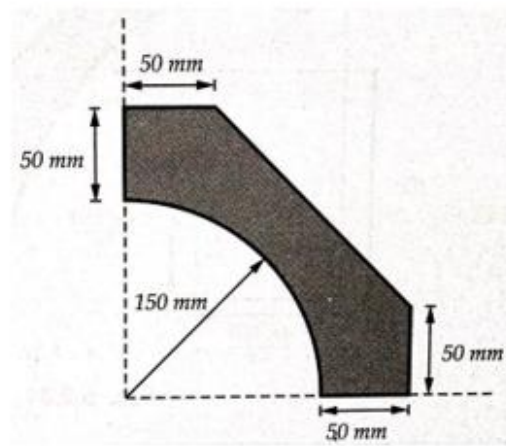

Fig Q4 (a)

  b) Determine the radius of gyration with respect to horizontal axis passing   **10**
      through centroid for the shaded area shown in Fig Q 4(b).
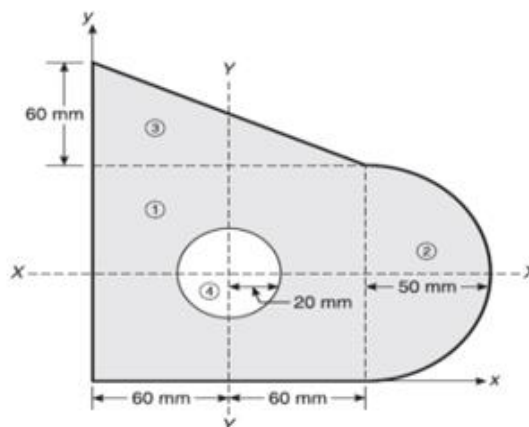

Fig Q 4(b).

UNIT - IV

5   a)   Find the least value of P required to cause the system of blocks shown in Fig   **10**
Q5 (a) to have impending motion to the left. The coefficient of friction under
30 KN block is 0.3 and under 10 KN block is 0.20. The string connecting the
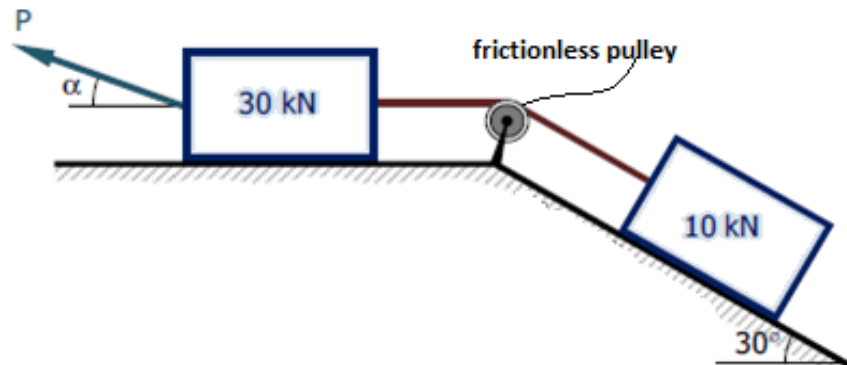two blocks is light and inextensible

Fig Q5 (a)

   b)   A uniform ladder of length 15m rests against a vertical wall making an angle   **10**
of 60^0 with the horizontal. Co efficient of friction between wall and the ladder
is 0.30 and between the ground and the ladder is 0.25. A man weighing 600N
ascends the ladder. How long will he be able to go before the ladder slips?
Find the horizontal push that is necessary to be applied at the bottom of the
ladder so as to be just sufficient to permit the man to go to the top. Assume
weight of the ladder to be 850N.

UNIT - V

6   a)   A cricket ball is hit by a batsman at height of 1. 5 m above the ground. The   **10**
ball is caught by the fielder near the boundary at a height of 0.65 m above the
ground exactly after 5 seconds. If the ball is hit with a velocity of 90 kmph.
find the angle at which the ball is to be hit by the batsman. Find also the
distance between the batsman and the fielder.

   b)   Explain the terms Range, Time of flight as applied to projectile motion and   **04**
writhe equations for the same with usual notations.

   c)   Obtain an expression for path traced by projectile   **06**

OR

7   a)   State and prove Work –Energy principle   **04**

   b)   A man weighing 600 N stands on an elevator moving downwards. The   **07**
elevator moves at first with an acceleration of $2ms^{-2}$, then with constant
velocity and finally with a retardation of $2ms^{-2.}$ Find the pressure on the floor
of the elevator exerted by the man in three cases. Solve using D'Alembert's
principle

   c)   A bullet of mass 20 gms moving at 300m/s pierces a 3 cm thick metal plate   **09**
and emerges out with a velocity of 200 m/s. Determine the resistance offered
by the plate assuming it to be uniform. Also determine the minimum number
of such plates each 3 cm thick to be placed together to stop the bullet. Assume
the same frictional force to be acting in both cases. Solve using Work-Energy
principle.

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