Register No : _____

# THE KAVERY ENGINEERING COLLEGE

*(An Autonomous Institution)*

UG/PG DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL/MAY 2026

*Third Semester*

Civil Engineering

ME3351 - ENGINEERING MECHANICS

*(Common to Mechanical Engineering)*

*Regulations - 2021*

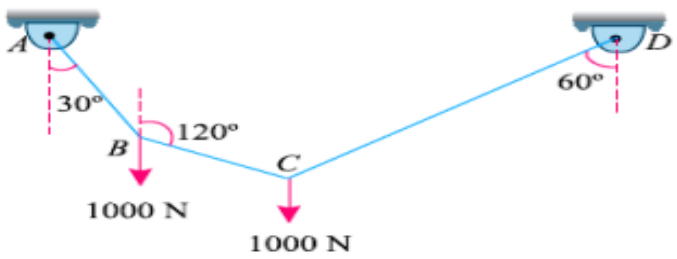
*Duration : 3 Hrs* *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

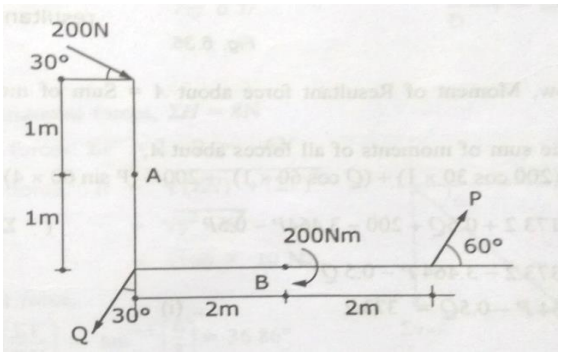
| *Q.No* | *Questions* | *BTL* | *CO* | *Marks* |
|---|---|---|---|---|
| 1. | State triangular law of forces. When this law will be used? | L2 | 1 | 2 |
| 2. | State the conditions of equilibrium of a particle in space. | L2 | 1 | 2 |
| 3. | List the types of load. | L1 | 2 | 2 |
| 4. | Distinguish between couple and moment. | L2 | 2 | 2 |
| 5. | State parallel axis theorem. | L1 | 3 | 2 |
| 6. | State pappus-Guldinus theorem for finding surface area. | L1 | 3 | 2 |
| 7. | Define Limiting friction. | L1 | 4 | 2 |
| 8. | Differentiate ladder friction and wedge friction. | L2 | 4 | 2 |
| 9. | Give mathematical definitions of velocity and acceleration. | L2 | 5 | 2 |
| 10. | What is curvilinear motion? | L1 | 5 | 2 |

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

| *Q.No* | | *Questions* | *BLT* | *CO* | *Marks* |
|---|---|---|---|---|---|
| 11. | a | A horizontal line PQRS is 12 m long, where PQ = QR = RS = 4 m. Forces of 1000 N, 1500 N, 1000 N and 500 N act at P, Q, R and S respectively with downward direction. The lines of action of these forces make angles of 90°, 60°, 45° and 30° respectively with PS. Find the magnitude, direction and position of the resultant force. | L3 | 1 | 16 |
| | | Or | | | |
| | b | A string ABCD, attached to fixed points A and D has two equal weights 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 Figure. Find the tensions in the portions AB, BC and CD of the string, if the inclination of the portion BC with the vertical is 120°. | L3 | 1 | 16 |

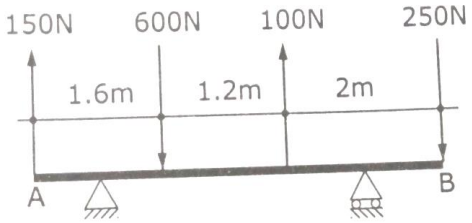


| | | | | | |
|---|---|---|---|---|---|
| 12. | a | For the system of forces shown in fig, determine the magnitudes of P and Q such that the resultant of the system passes through A and B. | L3 | 2 | 16 |

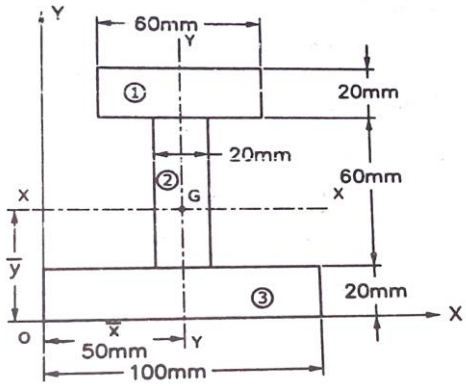



Or

| | | | | | |
|---|---|---|---|---|---|
| | b | A 4.8m beam is subjected to the forces shown in fig. Reduce the given system of forces to a) a single force b) an equivalent force – couple system at A c) force couple system at B. | L3 | 2 | 16 |

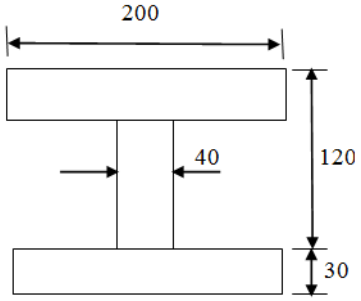


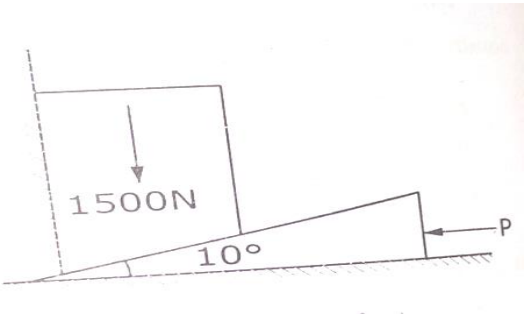
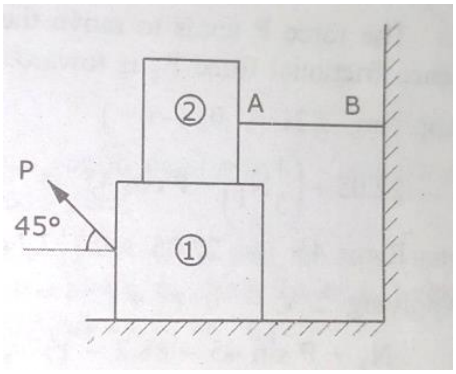

| | | | | | |
|---|---|---|---|---|---|
| 13. | a | Locate the centroid and moment of inertia about YY axis of an un symmetrical 'I' section as shown in below fig. | L3 | 3 | 16 |




Or

| | | | | | |
|---|---|---|---|---|---|
| | b | Locate the centroid and find moment of inertia about XX axis of an symmetrical 'I' section as shown in below fig. All dimensions are in mm. | L3 | 3 | 16 |



| | | | | | |
|---|---|---|---|---|---|
| 14. | a | A block overlying $10^c$ wedge on a horizontal floor and learning against a vertical wall and weighing $1500\ N$ is to be raised by applying a horizontal force to the wedge. Assuming co-efficient of friction between all the surfaces in contact to be $0.3$, determine the minimum horizontal force to be applied to raise the block.   | L4 | 4 | 16 |
| | | Or | | | |
| | b | Block (2) rests on block (1) and is attached by a horizontal rope $AB$ to the wall as shown in fig.. What force $P$ is necessary to cause motion of block (1) to impend?. The co-efficient of friction between the blocks is $¼$ and between the floor and block (1) is $1/3$. Mass of blocks (1) and (2) are $14\ kg$ and $9\ kg$ respectively.   | L4 | 4 | 16 |
| 15. | a | The Y-co-ordinate of a particle maving along a curve is $y = t^3 - 61 + 3$ where y is in metres and t in seconds. Its acceleration in x-direction is given by $a_x = 4t + 3\ m/s^2$. If velocity of the particle in x direction is 2 m/s when t = 0, calculate the magnitude and direction of velocity and acceleration of the particle when t = 1s. | L3 | 5 | 16 |
| | | Or | | | |
| | b | The 50 kg crate is projected along the floor with an initial speed of 7 m/s at x = 0. The coefficient of kinetic friction $\mu_k = 0.4$. Calculate the time required for the crate to come to rest and corresponding distance x travelled. | L3 | 5 | 16 |