Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **18ME1003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ENGINEERING MECHANICS** | **Max. Marks :** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Marks** |
|  | **PART – A (10X1=10 MARKS)** | | |
| 1. | \_\_\_\_\_\_\_\_\_ is the branch of science, which deals with the study of a body at rest. | CO1 | 1 |
| 2. | State the difference between moment and couple. | CO1 | 1 |
| 3. | Write the M.I formula for hollow rectangle. | CO2 | 1 |
| 4. | Define centroidal axes. | CO2 | 1 |
| 5. | What are the characteritics of kinematics? | CO3 | 1 |
| 6. | List out the terms used in kinematics of particle. | CO4 | 1 |
| 7. | When a large force acts for a long period of time, that force is called as impulsive force. (TRUE/FALSE) | CO4 | 1 |
| 8. | Write the symbols denoted by Angular displacement,angular velocity and acceleration. | CO5 | 1 |
| 9. | Mention the terms involved in rotation of rigid bodies.. | CO5 | 1 |
| 10. | Classify the dry friction. | CO6 | 1 |

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|  | **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | An electric light fixture weighting 15 N hangs from a point C, by two strings AC and BC. The string AC is inclined at 60° to the horizontal and BC at 45° to the horizontal as shown in Fig. | | CO1 | 3 |
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| 12. | Find the centre of gravity of a 100 mm × 150 mm × 30 mm T-section. | | CO2 | 3 |
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| 13. | The brakes of a train reduces its speed from 60 km/hr to 20 km/hr while its runs 200m. Assuming that there exists constant retarding force. Find how much distance travelled by train before coming to rest. | | CO3 | 3 |
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| 14. | A railway wagon of weight 4 KN is moving with a velocity of 25 m/s. A force of 200N acts on the wagon for 2 minutes. Calculate the velocity of the wagon, if the direction of the applied force is, (i) in the direction of motion. (ii) in the opposite direction. | | CO4 | 3 |
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| 15. | A flywheel starts rotating from rest and is given an acceleration of 2 rad/s2. Find the angular velocity and speed in rpm after 60sec. | | CO5 | 3 |
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| 16. | A wooden block of mass 40 kg is on rough inclined plane as shown in fig. What is the external force required to be applied parallel to the inclined plane in downward direction for impending motion? Coefficient of friction between block and plane is 0.4. | | CO6 | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is a Compulsory Question)** | | | | |
| 17. | a. | Determine the *‘x’* and*‘y’* components of each of the forces shown.  C:\Users\Sharon Goldena\Pictures\Screenshots\Screenshot (78).png | CO1 | 6 |
| b. | A force vector of magnitude 100N, is represented by a line AB of co-ordinates A(1,2,3) and B(5,8,12). Determine  (i) the components of the force along x,y, and z axes.  ii) angles with x,y and z axes.  iii) specify the force vector. | CO1 | 6 |
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| 18. | a. | As a part of the design of the new sailboat, it is desired to determine the drag force which may be expected at a given speed. To do so, a model of the proposed hull is placed in a test channel and three cables are used to keep its bow on the centreline of the channel. Dynamometer readings indicate that for a given speed, the tension is 200 N in cable AB and 300 N in cable AE. Determine the drag force exerted on the hull and the tension in cable AC.  C:\Users\Sharon Goldena\Pictures\Screenshots\Screenshot (69).png | CO1 | 12 |
| 19. | a. | State Parallel axis theorm. | CO2 | 2 |
| b. | Locate the moment of inertia of the sectioned area shown in the figure. | CO2 | 10 |
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| 20. | a. | A motor starts from rest and uniformly accelerated to speed of 20 kmph over a distance of 200m. Calculate the acceleration and time taken, if the further acceleration raises the speed to 50 kmph in 8 seconds. Find the acceleration and further distance moved. | CO3 | 4 |
| b. | The motion of a particle along a straight line is governed by the relation  a= t3-2t2+7, where a is the acceleration in m/s 2. It is observed that the velocity of the particle is 3.58 m/sec after 1 sec, the displacement is 9.39m after 4 sec. Calculate the displacement, velocity and acceleration at time t=2sec. | CO3 | 8 |
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| 21. | a. | Derive D’Alembert’s principle. | CO4 | 2 |
| b. | Two blocks A and B of weight 100N and 200N respectively are initially at rest on a 30° inclined plane as shown in figure. The distance between the blocks is  6m. The co-efficient of friction between the block A and the plane is 0.25 and that between the block B and the plane is 0.15. If they are released at the same time, in what time the upper block (B) reaches the lower Block (A). | CO4 | 10 |
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| 22. | a. | Derive the work energy equation. | CO4 | 2 |
| b. | Two bodies A and B of mass 80N and40N are connected by a thread and move along a rough horizontal plane under the action of a force 600 N applied to the first body of mass 80 kg as shown in Fig. The coefficient of friction between the sliding surfaces of the bodies and the plane is 0.4. Determine the Velocity of the system after 2 sec and the tension in the thread, using Impulse –Momentum Method. | CO4 | 10 |
| 23. | a. | List out the terms involved in Rotation of Rigidbodies. | CO5 | 4 |
| b. | A right circular cylinder of radius 0.5 m rolls without slipping along a horizontal plane as shown in fig. At a certain instant velocity of cylinder at centre is 3m/s. Determine the velocity of the points A,B,Camd D on the rim of the cylinder. | CO5 | 8 |
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|  | **Compulsory:** | | | |
| 24. | a. | Write short notes on coulomb’s law of dry friction. | CO6 | 2 |
| b. | A uniform ladder weighing 100N and 5m long has lower end B resting on the ground and upper end A resting against a vertical wall as shown in fig. The inclination of the ladder with horizontal is 60° , if the coefficient of friction at all surfaces of contact is 0.25. Determine how much distance up along the ladder a man weighing 600N can ascent without causing it to slip. | CO6 | 10 |