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



**End Semester Examination – Nov/Dec – 2017**

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| **Code :** | **14ME2001** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ENGINEERING MECHANICS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | With mathematical equations state Lami’s Theorem. | CO1 | 5 |
| b. | Two concurrent forces 12 N and 18 N are acting at an angle of 60°. Find the resultant force. | CO1 | 5 |
| c. | Five forces are acting on a particle. The magnitude of the forces are 300 N, 600 N, 700 N, 900 N and P and their respective angles with the horizontal are 60°, 135°, 210° and 270°. If the sum of vertical component of all the forces is -1000 N find the value of P. Also calculate the magnitude and the direction of the resultant, assuming that the first force acts towards the point, while all the remaining forces act away from the point. | CO1 | 10 |
| (OR) | | | | |
| 2. | a. | A smooth sphere of weight W is supported by a string fastened to a point A on the smooth vertical wall, the other end is in contact with point B on the wall as shown in figure. If the length of the string L is equal to 500 mm the radius ‘r’ of the sphere is equal to 200 mm, find the tension in the string and reaction of the wall.  Macintosh HD:Users:bobbyppaul:Desktop:Screen Shot 2017-10-12 at 2.59.21 PM.png | CO1 | 10 |
| b. | A block weighing 5 kN is suspended from the ceiling by a chain. It is pulled aside by a horizontal chord until the chain makes 60° with the ceiling as shown in the figure. Find the tension in the chain and in the chord by applying Lami’s theorem.  Macintosh HD:Users:bobbyppaul:Desktop:Screen Shot 2017-10-12 at 3.08.59 PM.png | CO1 | 10 |
| 3. | a. | The lines of action of three forces are concurrent at the orgin ‘O’, passes through points A, B and C having coordinates, (3, 0, -3), (2, -2, 4) and (-1, 2, 4) respectively. If the magnitude of the forces are 10 N, 30 N and 40 N, find the magnitude and direction of their resultant. | CO1 | 15 |
|  | b. | Discuss conditions of equilibrium. | CO1 | 5 |
| (OR) | | | | |
| 4. | a. | Four forces of magnitude and direction acting on a square ABCD of side 2 m are shown in figure. Calculate the magnitude and direction and also locate its point of application with respect to the sides AB and AD.  Macintosh HD:Users:bobbyppaul:Desktop:Screen Shot 2017-10-12 at 3.52.01 PM.png | CO1 | 15 |
|  | b. | Discuss Varignon’s Theorem. | CO1 | 5 |
|  |  |  |  |  |
| 5. | a. | Differentiate between Moment and Couple. | CO1 | 5 |
|  | b. | A 4.8 m beam is subjected to the forces shown in the figure. Reduce the given system of forces to i. a single force ii. an equilant force – couple system at A iii. force couple system at B.  Macintosh HD:Users:bobbyppaul:Desktop:Screen Shot 2017-10-13 at 2.15.46 PM.png | CO2 | 10 |
|  | c. | Locate centroid of the sectioned area shown in figure, L= 6 m. All dimensions are in m. | CO2 | 5 |
|  |  | (OR) |  |  |
| 6. | a. | Block (2) rests on block (1) and is attached by a horizontal rope AB to the wall as shown in the figure. What force P is necessary to cause motion of block (1) to impend?. The coefficient 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.  Macintosh HD:Users:bobbyppaul:Desktop:Screen Shot 2017-10-13 at 2.52.53 PM.png | CO3 | 15 |
|  | b. | Enumerate Cone of friction. | CO3 | 5 |
|  |  |  |  |  |
| 7. | a. | Find the moment of inertia of an unsymmetrical I section shown in figure about its centroidal axes. a= 20 mm, b=100 mm, c= 60 mm.Macintosh HD:Users:bobbyppaul:Desktop:Screen Shot 2017-10-13 at 2.22.16 PM.png | CO2 | 20 |
| (OR) | | | | |
| 8. | a. | Two blocks A (mA= 28 kg), B (mb= 28 kg) are separated by 12 m as shown in the figure. If the blocks start moving, find the time t when the blocks collide. Assume µ = 0.25 for block A and plane and µ = 0.1 for block B and plane. | CO3 | 15 |
|  | b. | State parallel axis theorem. | CO3 | 5 |
|  | | **Compulsory:** |  |  |
| 9. |  | A uniform ladder weighing 100N and 5 meters 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 the friction at all surfaces of contact is 0.25;  determine how much distance up long the ladder a man weighing  600N can ascent without causing it to slip. | CO4 | 20 |

ALL THE BEST