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

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **18ME2003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **THEORY OF MACHINES** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Course Outcome** | **Marks** |
|  | **PART-A (20X1=20 MARKS)** | | |
| 1. | Define the term ‘Higher pair’. | CO1 | 1 |
| 2. | The number of degrees of freedom or movability (n) of a Four bar mechanism is \_\_\_\_\_\_\_\_\_\_\_\_. | CO1 | 1 |
| 3. | What is a Ternary joint? | CO1 | 1 |
| 4. | Name any one inversion of a Single slider crank chain. | CO1 | 1 |
| 5. | The direction of linear velocity of any point on a link with respect to another point on the same link is \_\_\_\_\_\_\_\_\_\_\_\_ to the link joining the points. | CO2 | 1 |
| 6. | Define the term ‘Addendum’. | CO3 | 1 |
| 7. | What is meant by ‘module’ as used in gears? | CO3 | 1 |
| 8. | The two parallel and co-planar shafts connected by the gears are called \_\_\_\_\_\_\_\_\_\_\_\_ gears. | CO3 | 1 |
| 9. | What is meant by a compound gear train? | CO3 | 1 |
| 10. | What is the function of a flywheel? | CO4 | 1 |
| 11. | Define the term ‘coefficient of fluctuation of energy’, in the case of flywheels. | CO4 | 1 |
| 12. | In a single plate clutch considering uniform wear, the relation between the intensity of pressure (p) at a distance (r) from the axis of the clutch, is given by \_\_\_\_\_\_\_\_\_\_\_\_. | CO4 | 1 |
| 13. | What is meant by ‘slip’ of the belt? | CO4 | 1 |
| 14. | Name any two types of Flat Belt Drives. | CO4 | 1 |
| 15. | What is the function of a governor ? | CO5 | 1 |
| 16. | Write the expression to find the speed (N) of a Watt Governor. | CO5 | 1 |
| 17. | Define the term ‘height’ of the governor. | CO5 | 1 |
| 18. | When the sleeve of a Porter governor moves downwards, the governor speed \_\_\_\_\_\_\_\_\_\_\_\_. | CO5 | 1 |
| 19. | Define the term ‘static balancing’. | CO6 | 1 |
| 20. | Write the equation for balancing a single rotating mass by a single mass. | CO6 | 1 |

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| **PART B (10 X 5= 50 MARKS)**  **(Answer any 10 from the following)** | | | |
| 21. | Sketch and explain any one inversion of a Four bar chain. | CO1 | 5 |
| 22. | Explain the following terms: (i) Turning pair; (ii) Spherical pair and  (iii) Kinematic chain. | CO1 | 5 |
| 23. | In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40 mm long and rotates at 120 r.p.m. clockwise, while the link CD = 80 mm oscillates about D. BC and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60°. | CO2 | 5 |
| 24. | Two involute gears of 20° pressure angle are in mesh. The number of teeth on pinion is 20 and the number of teeth on gear is 40. If the pitch expressed in module is 5 mm and assuming addendum as standard and equal to one module, find the length of path of contact and arc of contact. | CO3 | 5 |
| 25. | Differentiate between reverted gear train and epicyclic gear train. | CO3 | 5 |
| 26. | Find the power transmitted by a belt running over a pulley of 600 mm diameter at 200 r.p.m. The coefficient of friction between the belt and the pulley is 0.25, angle of lap 160° and maximum tension in the belt is 2500 N. | CO4 | 5 |
| 27. | A multiple disc clutch has five plates having four pairs of active friction surfaces. If the intensity of pressure is not to exceed 0.127 N/mm2, find the power transmitted at 500 r.p.m. The outer and inner radii of friction surfaces are 125 mm and 75 mm respectively. Assume uniform wear and take coefficient of friction = 0.3 | CO4 | 5 |
| 28. | Determine the maximum pressure in a single plate clutch, when the axial force is 4 kN. The inside radius of the contact surface is 50 mm and the outside radius is 100 mm. Assume uniform wear. | CO4 | 5 |
| 29. | The arms of a Porter governor are each 250 mm long and pivoted on the governor axis. The mass of each ball is 5 kg and the mass of the central sleeve is 30 kg. The radius of rotation of the balls is 150 mm when the sleeve begins to rise and reaches a value of 200 mm for maximum speed. Determine the minimum speed of the governor. | CO5 | 5 |
| 30. | Define and explain the following terms relating to governors :  (i) Stability; (ii) Sensitiveness and (iii) Hunting. | CO5 | 5 |
| 31. | Four masses m1, m2, m3 and m4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45°, 75° and 135°. Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m. | CO6 | 5 |
| 32. | Four masses A, B, C and D as shown below are to be completely balanced.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | A | B | C | D | | Mass (kg) | -- | 30 | 50 | 40 | | Radius (mm) | 180 | 240 | 120 | 150 |   The planes containing masses B and C are 300 mm apart. The angle between planes containing B and C is 90°. B and C make angles of 210° and 120° respectively with D in the same sense. Find the magnitude of mass A. | CO6 | 5 |

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|  | **PART C (2 X 15= 30 MARKS)**  **(Answer any 2 from the following)** | | | |
| 33. |  | An epicyclic gear consists of three gears A, B and C as shown in Fig. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 r.p.m. If the gear A is fixed, determine the speed of gears B and C. | CO3 | 15 |
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| 34. |  | The turning moment diagram for a petrol engine is drawn to the following scales : Turning moment, 1 mm = 5 N-m ; crank angle, 1 mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm2. The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m. | CO4 | 15 |
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| 35. |  | A Proell governor has equal arms of length 300 mm. The upper and lower ends of the arms are pivoted on the axis of the governor. The extension arms of the lower links are each 80 mm long and parallel to the axis when the radii of rotation of the balls are 150 mm and 200 mm. The mass of each ball is 10 kg and the mass of the central load is 100 kg. Determine the range of speed of the governor. | CO5 | 15 |