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



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – April / May – 2017**

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| **Code :** | **14ME2027** | **Duration :** | **3hrs** |
| **Sub. Name :** | **DYNAMICS OF MACHINERY** | **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 slider crank mechanism ABC subjected to an external force of 3000 N on the slider is shown in figure. Determine the various forces acting on the links. Also calculate the driving torque T.  G:\slider crank1.jpg | CO 1 | | 20 |
| (OR) | | | | | |
| 2. |  | The turning moment diagram for a multicylinder engine has been drawn to a scale of 1 mm = 4500 Nm vertically and 1 mm = 2.4º horizontally. The intercepted areas above and below the mean torque line in order are 342, -23, 245, -303, 115, -232, 227 and -371 mm2, when the engine is running at 150 rpm. If the mass of the flywheel is 1000 kg and the total fluctuation of speed does not exceed 3% of the mean speed, find the minimum value of the radius of gyration. | CO 1 | 20 | |
| 3. |  | Four masses A, B, C and D are completely balanced. Masses C and D make angles of 90º and 210º respectively with B in the same sense. The planes containing B and C are 300 mm apart. Masses A, B, C and D are assumed to have a radii of 360, 480, 240 and 300 mm respectively. The masses B, C and D are 15 kg, 25 kg and 20 kg respectively. Determine: (i) The mass A and its angular position and (ii) The position of planes A and D. | CO 2 | 20 | |
| (OR) | | | | | |
| 4. |  | A twin cylinder locomotive has a crank 90º apart. Mass of the reciprocating parts is 300 kg; Crank cylinder diameter is 0.6 m; Distance between the driving wheel control planes is 1.55 m; Distance between cylinder centre lines is 0.65 m; Driving wheel diameter is 1.8 m. Find the variation in tractive effort and swaying couple. | CO 2 | 20 | |
| 5. | a. | A shaft of diameter 10 mm carries at its centre a mass of 12 kg. It is supported by two bearings that are 400 mm apart. Find the whirling speed (i) neglecting the mass of the shaft; (ii) taking the mass of the shaft into consideration. The density of the shaft material is 7500 kg/m3. Take E = 200 GN/m2. | CO 3 | 10 | |
|  | b. | A vibrating system consists of a mass of 70 kg; a spring of stiffness 40 kN/m and a damper. The damping factor is 0.25. Determine: (i) The critical damping coefficient; (ii) Natural frequency of damped vibrations; (iii) The logarithmic decrement; (iv) The ratio of two successive amplitudes. | CO 3 | 10 | |
| (OR) | | | | | |
| 6. | a. | A shaft 180 mm diameter is supported in two bearings 2.5 m apart. It carries three discs of mass 250 kg; 500 kg and 200 kg at 0.6 m, 1.5 m and 2 m from the left end. Determine the natural frequency of transverse vibrations. Take modulus of elasticity for the shaft material as 211 GN/m2. | CO 3 | 10 | |
|  | b. | Mass of a single degree damped vibration system measures 7.5 kg and makes 24 free oscillations in 14 seconds, when disturbed from its equilibrium position. The amplitude of vibration reduces to 0.25 of its initial value after 5 oscillations. Determine: (i) Stiffness of the spring; (ii) Logarithmic decrement; (iii) Damping factor; (iv) Damping coefficient; (v) Criical damping coefficient. | CO 3 | 10 | |
| 7. |  | A steel shaft 1.6 m long is 95 mm in diameter for the first 0.6 m of its length, 60 mm in diameter for the next 0.5 m of length and 50 mm in diameter for the remaining 0.5 m of its length. The shaft carries two flywheels at its two ends; the first having a mass of 800 kg and 0.85 m radius of gyration located at the 95 mm diameter end and the second having a mass of 600 kg and 0.55 m radius of gyration located at the other end. Find the location of the node and the natural frequency of free torsional vibration of the system. The modulus of rigidity of the shaft material is 80 GN/m2. | CO 3 | 20 | |
| (OR) | | | | | |
| 8. |  | Three rotors A, B and C having moment of inertia of 2000; 6000 and 3500 kg-m2 respectively are carried on a uniform shaft of 0.35 m diameter. The length of the shaft between the rotors A and B is 6 m and between rotors B and C is 32 m. Find the natural frequency of torsional vibrations. The modulus of rigidity for the shaft material is 80 GN/m2. | CO 3 | 20 | |
|  | | **Compulsory**: |  |  | |
| 9. |  | A Porter governor has two balls each of mass 3 kg and a central load of mass 15 kg. The arems are all 200 mm long and pivoted to the axis. If the maximum and minimum radii of rotation of the balls are 160 mm and 120 mm respectively, find the minimum and maximum speeds and also the range of speed. | CO 4 | 20 | |