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 :** | **14ME3023** | **Duration :** | **3hrs** |
| **Sub. Name :** | **DESIGN OF MECHANICAL SYSTEM ELEMENTS** | **Max. marks :** | **100** |

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

**Use of approved Data book & Data sheets are permitted**

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| Q. No. | Sub Div. | Questions | Course  Outcome | Marks |
| 1. | a. | Show the terminology of a pressure vessel with help of a neat sketch and explain in details. Also derive an equation of Ligament efficiency. | CO1 | 10 |
| b. | Derive an equations of induced hoop and longitudinal stress of cylindrical, spherical, conical vessels are under internal pressure. | CO2 | 10 |
| (OR) | | | | |
| 2. | a. | With a block diagram differentiate the main group of material handling equipments and explain each with an example . | CO1 | 10 |
| b. | Show the different types of grabbing devices and explain its applications with suitable examples. | CO1 | 10 |
|  | | | | |
| 3. | a. | Find the radial tension and normal stress induced in a wedge type of pressure vessel .The vessel is subjected to 50kN .The angle between an element and the axis of the wedge is 300 (teta) and the angle between the axis to wedge face is 600 (alpha). The distance between the element axis and the apex of the wedge(r) is 150mm and the distance between the horizontal axis passing through the element to the apex of the wedge is 160mm (a). Take the thickness of the vessel is 8mm. Also find out the stress concentration and show the arrangement of wedge. | CO3 | 15 |
|  | b. | Find out the capacity of an inclined conveyor if the power of the motor is 8 kW and the height to be lifted is 10 m . | CO3 | 5 |
| (OR) | | | | |
| 4. | a. | Select a suitable wire rope to lift 20 kN of debris from a well 70 m deep. The weight of the bucket is 8kN. The weight is being lifted with a maximum speed of 150 m/min and the maximum speed is attained in 3 second. Determine also the stress induced in the rope  due to starting with an initial slack of 0.1 m. | CO3 | 15 |
|  | b. | Show the reinforcement given in a pressure vessels and mention the need of it. | CO2 | 5 |
|  | | | | |
| 5. | a. | A power of 20 kW, is to be transmitted through a cone clutch at 500 rpm. For uniform wear condition, find the main dimensions of clutch and shaft. Also determine the axial force required to engage the clutch. Assume the coefficient of friction as 0.25, the maximum normal pressure on the friction surface is not to exceed 0.08 MPa and the design stress for the shaft material as 40 MPa. | CO1 | 15 |
|  | b. | Describe the difference between the plate cluthch and conical clutch and write its applications . | CO2 | 5 |
| (OR) | | | | |
| 6. | a. | Design a 12 speed Gear box if the lower and higher speeds are 31.5 rpm and 1410 rpm respectively.Take the structure as 2 x 3 x 2.Draw the ray, lay diagram and find out the number of teeth on 3rd stage gears. | CO3 | 15 |
|  | b. | Describe the effect of stress concentration in the machines components with suitable examples. | CO2 | 5 |
|  | | | | |
| 7. | a. | Show the arrangements of a vertical and horizontal screw conveyor and mention its design aspects in detail . | CO1 | 10 |
|  | b. | Design a forged single hook of a crane which is used to lift a load of 5 tons . The grabbing tongs weight is 1tons. Also find out the stresses acting on the inner and outer fibre of the hook. | CO3 | 10 |
| (OR) | | | | |
| 8. | a. | Show the various arrangement of pneumatic and hydraulic conveyor and explain in detail. | CO1 | 10 |
|  | b. | Write the applications of vibrating conveyor and explain its working  principle. | CO2 | 5 |
|  | c. | Explain the application of an escalator and describe its design concepts. | CO2 | 5 |
|  | | **Compulsory:** |  |  |
| 9. | a. | A winch has to carry a load of debris from a mount to an another location and it is controlled by a ratcht and pawl arrangement .The braking torque is 180 Nm and take the number of teeth on ratchetwheel is 16.Design the ratchet and pawl. | CO3 | 15 |
|  | b. | A rectangular bar has to carry a load of 100 kN.What must be the thickness of bar of 110mm width with a rivet hole of 22mm diameter on its centre line? Take the working stress for the bar is 75 Mpa. | CO3 | 5 |

**ALL THE BEST**