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

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(Karunya Institute of Technology & Sciences)

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

**UNIVERSITY**

**End Semester Examination – Nov/Dec - 2016**

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| **Code :** | **09ME206** | **Duration :** | **4 hrs** |
| **Sub. Name :** | **Design of Machine Elements** | **Max. marks :** | **100** |

#### **(Use of approved design data book is permitted)**

#### **Answer ALL questions**

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| **PART - A (10 X 1 =10 MARKS)** | | |
| 1. | When the material is loaded within elastic limit, then the stress is \_\_\_\_\_\_\_\_\_\_\_\_to strain. | (1) |
| 2. | Rankine’s theory is used for \_\_\_\_\_\_\_\_\_\_\_\_materials. | (1) |
| 3. | Define: Notch sensitivity. | (1) |
| 4. | What are the factors affecting endurance limit? | (1) |
| 5. | What is a laminated leaf spring? | (1) |
| 6. | Define critical speed of a shaft. | (1) |
| 7. | \_\_\_\_\_\_\_\_\_\_ Coupling is used for collinear shafts. | (1) |
| 8. | \_\_\_\_\_\_\_ is used to connect two rods whose axes either coincide (or) intersect and lie in one plane. | (1) |
| 9. | What is the function of connecting rod in IC Engine? | (1) |
| 10. | Gudgeon pin is made of \_\_\_\_\_\_\_\_ material. | (1) |

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| **PART - B (5 X 3 = 15 MARKS)** | | |
| 11. | Describe material properties: Toughness and Creep. | (3) |
| 12. | What is an S-N curve? | (3) |
| 13. | State any two reasons for preferring hollow shaft over solid shaft? | (3) |
| 14. | What are the uses of piston rings? | (3) |
| 15. | Define coefficient of fluctuation of speed and coefficient of steadiness. | (3) |

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| **PART - C (5 X 15 = 75 MARKS)** | | |
| 16. | A mild steel bracket as shown in fig. is subjected to a pull of 6000 N acting at 45° to its horizontal axis. The bracket has a rectangular cross section whose depth is twice the thickness. Find the cross sectional dimensions of the bracket, if the permissible stress in the material of the bracket is limited to 60 MPa.  C:\Users\RAJESH\Desktop\Capture.PNG | (15) |
| **(OR)** | | |
| 17. | A mild steel shaft of 50 mm diameter is subjected to a bending moment of 2000 N-m and a torque T. if the yield point of the steel in tension is 200 MPa, find the maximum value of this torque without causing yielding of the shaft according to   1. The maximum principal stress, 2. The maximum shear stress, and 3. The maximum distortion strain energy theory. | (15) |
| 18. | A circular bar of 500 mm is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 20 kN and a maximum value of 50 kN. Determine the diameter of bar by taking a Factor of Safety of 1.5, size effort of 0.85, Surface finish factor 0.9. The material properties of bar are given by: ultimate strength of 650 MPa, yield strength of 500 MPa and endurance strength of 350 MPa | (15) |
| **(OR)** | | |
| 19. | Design and draw a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 N/mm2 and modulus of rigidity, G = 84 kN/mm2. Neglect the effect of stress concentration. Draw a fully dimensioned sketch of the spring, showing details of the finish of the end coils. | (15) |
| 20. | A mild steel shaft transmits 20 kW to 200 rpm. It carries a central load of 900 N and is simply supported between the bearing 2.5 m apart. Determine the size of the shaft, if the allowable shear stress is 42 MPa and the maximum tensile or compressive stress does not exceed 56 MPa. Find the size of the required shaft, if it is subjected to gradually applied load. | (15) |
| **(OR)** | | |
| 21. | Design and draw a cast iron flange coupling for a mild steel shaft transmitting 90 kW at 250 rpm. The allowable shear stress in the shaft is 40 MPa and the angle of twist is not to exceed 10 mm in a length of 20 mm diameters. The allowable shear stress in the coupling bolt is 30 MPa. | (15) |
| 22. | A knuckle joint is to transmit a force of 150 kN. Allowable stresses in tension, shear and compression is 75 N/mm2, 65 N/mm2 and 150 N/mm2 respectively. Design and draw the joint. | (15) |
| **(OR)** | | |
| 23. | Design and draw a sleeve and cotter joint to resist a tensile load of 60 kN. All the parts of the joints are made of the same material. Allowable stresses in tension, shear and compression is 60 N/mm2, 70 N/mm2 and 125 N/mm2 respectively. | (15) |
| 24. | Design and draw a cast iron piston for a single acting four stroke engine for the following data:  Cylinder Bore = 100 mm; Stroke = 125 mm; Maximum Gas Pressure = 5 N/mm2; Indicated Mean Effective Pressure = 0.75 N/mm2; Mechanical Efficiency = 80%; Fuel Consumption = 0.16 kg per brake per hour; Higher Calorific Value of fuel = 42 MJ/kg; Speed = 2000 rpm. Any other data required for the design may be assumed. | (15) |
| **(OR)** | | |
| 25. | The turning moment diagram of a multi-cylinder engine is drawn with a scale of (1 mm = 2.4o) on the abscissa and (1 mm = 650 N-m) on the ordinate. The intercepted areas between the torque developed by the engine and the mean resisting torque of the machine, taken in order from one end are –32, +408, –267, +333, –310, +226, –374, +260 and –244 mm2. The engine is running at a mean speed of 300 rpm and the coefficient of speed fluctuations is limited to 0.03. If the hoop stress in the material of the rim not to exceed 5.6 MPa, determine the suitable diameter and cross-section for the flywheel, assuming that the width is equal to 4 times the thickness. The density of the material may be taken as 7200 kg/m3. Determine the dimensions of the rim. Neglect the effect of the boss and arms. | (15) |

**ALL THE BEST**