ARUNACHAL PRADESH PUBLIC SERVICE COMMISSION

Mechanical Engineering (Conventional essay type)

PAPER – II

Max. Marks: 200   Time: 3 Hours

Note: Answer any five full questions. All questions carry equal marks. Make suitable assumptions wherever necessary by clearly indicating the same. Draw neat diagrams wherever necessary. Programmable calculators are not allowed

I. 1. Define: (i) Pressure angle, (ii) Circular pitch, (iii) Module, (iv) Addendum   (08)

2. Explain how the turning moment diagram of a steam turbine is obtained with neat sketches.   (12)

3. Give the classification of Governors.   (08)

4. What is balancing? Show how the balancing is done in case several masses revolving in the same plane.   (12)

II. 1. What is meant by single shear and double shear in riveted joints?   (06)

2. How are riveted joints made air tight?   (04)

3. When is a fillet weld called (i) transverse fillet weld and (ii) parallel fillet weld?   (06)

4. Distinguish between:
    (i)   Metric and BSW threads
    (ii) Square and ACME threads
    (iii) Pitch and lead of a screw thread   (12)

5. Two shafts, one solid and other hollow, have the same weight and transmit the same torque. Calculate the ratio of the maximum shear stress induced in the solid shaft to that in the hollow shaft. The inner diameter of the hollow shaft is 50% of the outer diameter.   (12)

III. 1. Define: (i) Young's modulus, (ii) Mohr's circle, (iii) Helical spring   (12)

2. Show that for a simply supported cantilever beam of span 'L' subjected to uniformly distributed load of intensity 'w' per unit length, the maximum bending moment is $wL^2/8$.   (12)

3. Discuss the important theories of failures as used for two – dimensional state of stress.   (08)

4. Derive an expression for finding out the relationship between the driving tensions in case of flat belt drives in terms of angle of lap and coefficient of friction.   (08)

IV.   1.   Define: (i) Annealing, (ii) Normalizing, (iii) Quenching, (iv) Tempering   (12)

    2.   Suggest suitable materials for following components giving reasons for their choice: (i)Turbine blades, (ii) Connecting rod, (iii) Lathe bed, (iv) Bearings   (08)

    3.   Give the classification of ferrous materials based on carbon contents.   (08)

    4.   Why are metals in the pure form not suitable in industrial applications?   (04)

    5.   Define the following mechanical properties and their importance in mechanical engineering design: (i) yield strength, (ii) ultimate strength   (08)

V.   1.   Differentiate between Pressure die casting and Permanent mould casting.   (08)

    2.   Define: (i) hot working and cold working, (ii) metal forming processes, (iii) super finishing operations   (12)

    3.   Explain the various elements of a single point cutting tool, with the help of a neat sketch.   (08)

    4.   What is meant by 'tool designation' or 'tool signature'?   (03)

    5.   Define: (i) tool life, (ii) machinability, (iii) chip breaker   (09)

VI.   1.   Define: (i) work study, (ii) Motion study   (08)

    2.   Differentiate: (i) PERT and CPM, (ii) CNC and DNC   (12)

    3.   What are the problems with traditional production planning and control?   (12)

    4.   What are the factors to be considered in plant layout?   (08)

VII.   Write short notes on: (5x8=40)
    (i)   Value engineering
    (ii)   Work measurement
    (iii)   Queuing theory
    (iv)   Jigs and fixtures
    (v)   Material handling

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