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10MR55

Fifth Semester B.E. Degree Examination, June/July 2015

Marine Machinery and System Design

Time: 3 hrs.

Max. Marks:100

- Note:1. Answer FIVE full questions, selecting at least TWO questions from each part.
2. Missing data may be assumed.
3. Use data handbook if necessary.**

PART – A

- 1 a. What are the methods of manufacturing? Write the design consideration during forging. (10 Marks)
 b. An otto cycle engine develops 50kw at 150rpm with 75 explosions per minute. The change of speed from the commencement to the end of the power stroke must not exceed 0.5% of mean on either side. Design an suitable rim section having width four times the depth so that the hoop stress does not exceed 4MPa. Assume that the flywheel stores 16/15 times the energy stored by the rim and that the work done during the power stroke is 1.40 times the work done during the cycle. Density of rim material is 7200 kg/m³. (10 Marks)
- 2 a. A shaft is supported on bearing A and B 800mm between centers. A 20° straight tooth spur gear having 600mm pitch diameter is located 200mm to the right of the left hand bearing A, and a 700mm diameter pulley is mounted 250mm towards the left of bearing B. The gear is driven by a pinion with a downward tangential force while the pulley drives a horizontal belt having 180° angle of wrap. The pulley also serves as a flywheel and weighs 2000N. The maximum belt tension is 3000 N and the tension ratio is 3:1. Determine the maximum bending moment and the necessary shaft diameter, if the allowable shear stress of the material is 40 MPa. (12 Marks)
 b. A hollow shaft is subjected to a maximum torque of 1.5kN – m and a maximum bending moment of 3kN – m. It is subjected to an axial load of 10kN. Assume that the load is applied gradually and the ratio of the inner diameter to the outer diameter is 0.5. If the outer diameter of the shaft is 80mm, find the shear stress induced in the shaft. (08 Marks)
- 3 a. A single cylinder double acting steam engine develops 150kW at a mean speed of 80 rpm. The co-efficient of fluctuation of energy is 0.1 and the fluctuation of speed is ± 2% of mean speed. If the mean diameter of the flywheel rim is 2m and the hub and spokes provide 5% of the rotational inertia of the flywheel, find the mass of the flywheel and cross – sectional area of the rim. Assume the density of the flywheel material as 7200 kg/m³. (08 Marks)
 b. Design a csst iron piston for a single acting four stroke engine for the following data
 Cylinder bore = 100mm ; stroke = 125mm ; max gas pressure 5N/mm²
 Indicated mean effective pressure = 0.75 N/mm² ; Mechanical efficiency = 80% ;
 Fuel consumption = 0.15 kg per break power per hour ; Higher calorific value of fuel = 42 × 10³ kJ/kg ; speed = 2000rpm.
 Any other data required for the design may be assumed. (12 Marks)
- 4 a. A helical torsion spring of mean diameter 60mm is made of a round wire of 6mm diameter. If a torque of 6N-m is applied on the spring, find the bending stress induced and the angular deflection of the spring in degrees. The spring index is 10, and modulus of elasticity for the spring material is 2000 kN/mm². The number of effective turns may be taken as 5.5. (06 Marks)

- b. Explain thrust bearing with neat sketch. (06 Marks)
- c. Give a brief design of mechanical pilot valve. (08 Marks)

PART – B

- 5 Write a short notes on
 - a) Thrust Blocks
 - b) Intermediate shaft
 - c) Tail – end shaft
 - d) Water cooling system. (20 Marks)
- 6 a. Explain with neat sketch the working of self D – sludging of lube oil purifier. (10 Marks)
- b. Explain with neat sketch electro hydraulic 4 ram steering gear system. (10 Marks)
- 7 a. Explain with neat sketch, the multistage compressor. (10 Marks)
- b. With a neat line diagram explain starting air system for a large two – stroke engine. (10 Marks)
- 8 a. With a neat sketch, explain scavenging and exhaust system of a two stroke marine diesel engine. (10 Marks)
- b. What are the types of scavenging arrangements? Explain with neat sketch. (10 Marks)

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