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10MR55

Fifth Semester B.E. Degree Examination, June/July 2016

Marine Machinery and System Design

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Use data hand book if necessary.

PART – A

1 a. Write the design considerations of casting. **(06 Marks)**

b. Define unilateral and bilateral tolerances. **(04 Marks)**

c. Derive an expression for fluctuation of energy in the flywheel. $\Delta E = 2EC_S$. **(10 Marks)**

2 a. A steel solid shaft transmitting 15 KW at 200 rpm is supported on two bearings 750 mm apart and has two gears keyed to it. The pinion having 30 teeth of 5 mm module is located 100 mm to the left of the right hand bearing and delivers power horizontally to the right. The gear having 100 teeth of 5 mm module is located 150 mm to the right of the left hand bearing and receives power in a vertical direction from below. Using an allowable stress of 54 MPa in shear, determine the diameter of the shaft. **(10 Marks)**

b. A hollow steel shaft is to transmit 20 KW at 300 rpm. The loading is such that the maximum bending moment is 1000 N-m, the maximum torsional moment is 500 N-m and axial compressive load is 15 kN. The shaft is supported on rigid bearings 1.5m apart. The maximum permissible shear stress on the shaft is 40 MPa. The inside diameter is 0.8 times the outside diameter. The load is cycle in nature and applied with shocks. The values for the shock factors are $k_t = 1.5$ and $k_m = 1.6$. **(10 Marks)**

3 a. Design a cost iron piston for a single acting four stroke engine for the following data :

Cylinder bore	= 100 mm,
Stroke	= 125 mm
Max gas pressure	= 5 N/mm^2
Mechanical efficiency	= 80%
Mean effective pressure	= 0.75 N/mm^3
Fuel consumption	= 0.15 kg per BP/hour
Higher calorific value of fuel	= 42 × 10^3 kJ/kg
Speed	= 200 rpm

Any other data required for the design may be assumed. **(14 Marks)**

b. Define solid length, Free length, and spring index. **(06 Marks)**

4 a. The areas of the turning moment diagram for one revolution of a multi–cylinder engine with reference to the mean turning moment, below and above the line are :
–32, +408, –267, +333, –310, +226, –374, +260 and –244 mm^2
The scale for abscissa and ordinate are 1 mm = 2.4° and 1 mm = 650 N-m respectively. The mean speed is 300 rpm. With a percentage speed fluctuation of ± 1.5%. If the hoop stress in the material of the rim is 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/m^3. Neglect the effect of the boss and arms. **(10 Marks)**

b. A full journal bearing of 50 mm diameter and 100 mm long has a bearing pressure of 1.4 N/mm^2. The speed of the journal is 900 rpm and the ratio of journal diameter to the diametral clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at the operating temperature of 75°C may be taken as 0.011 kg/m-s. The room temperature is 35°C. Find :
i) The amount of artificial cooling required and
ii) The mass of the lubricating oil required
If the difference between the outlet and inlet temperature of the oil is 10°C. Take specific heat of the oil as 1850 J/kg/°C. **(10 Marks)**

PART – B

5 a. Explain with neat sketch electro-hydraulic 4-ram steering gear system. **(10 Marks)**
b. Explain with neat sketch working of self –D sludging of lube oil purifier. **(10 Marks)**

6 a. With neat sketch explain heat exchanges used in diesel engine. (Tube type). **(10 Marks)**
b. Write short notes on :
i) Thrust blocks
ii) Intermediate shaft. **(10 Marks)**

7 a. Sketch and explain 2-stage reciprocating air-compressor (compound type). **(10 Marks)**
b. Explain with neat sketch suction and spill controlled fuel pump. **(10 Marks)**

8 a. With neat sketch explain Air-start valve. **(10 Marks)**
b. Explain types of scanning with neat sketch. **(10 Marks)**

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