Fifth Semester B.E. Degree Examination, June/July 2018
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. *Use design 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 $\Delta E = 2EG$.   **(10 Marks)**

2 a. A steel solid shaft transmitting 15kW at 200rpm is supported on two bearings 750mm apart and has two gears keyed to it. The pinion having 30 teeth of 5mm module is located 100mm to the left of the right hand bearing and delivers power horizontally to the right. The gear having 100 teeth of 5mm module is located 150mm to the right of the left hand bearing and receives power in a vertical direction from below. Using an allowable stress of 54MPa in shear, determine the diameter of the shaft.   **(10 Marks)**
   b. A hollow steel haft is to transmit 20kW at 300rpm. The loading is such that the maximum bending moment is 1000N-m the maximum torsional moment is 500N-m and axial compressive load is 15kN. The shaft is supported on rigid bearings 1.3m apart. The maximum permissible shear stress on the shaft is 40MPa. The inside diameter is 0.8 times the outside diameters. The load is cyclic 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 cast iron Piston for a single acting four stroke engine for the following data :

cylinder bore	=	100mm
Stroke	=	125mm
Max gas pressure	=	5N/mm²
Mean effective pressure	=	0.75 N/mm²
η_{mech}	=	80%
Higher calorific value	=	42×10^3 kJ/Kg of the fuel
Fuel consumption	=	0.15Kg per BP/hours
Speed	=	2000 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 area 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 mm².
   The scale for abscissa and ordinate are 1mm = 2.4° and 1mm = 650 N-m respectively. The mean speed is 300rpm with a percentage speed fluctuation of ±1.5%. If the hoop stress in the material of the rim is not to exceed 5.6MPa. 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. Neglect the effect of the boss and arms.   **(10 Marks)**

b. A full Journal bearing of 50mm diameters and 100mm long has a bearing pressure 1.4 N/mm². The speed of the journal is 900rpm and the ratio of journal diameter to the dia-metral clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at the operating temp of 75°C may be taken as 0.011kg/m-s. The room temperature is 35°C find :

   i) The amount of artificial cooling required
   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 exchanger 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-stages reciprocating air-compressor (composed 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 scavenging with neat sketch.   **(10 Marks)**

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