

III B. Tech II Semester Supplementary Examinations, November/December-2016
DESIGN OF MACHINE MEMBERS – II
(Mechanical Engineering)

Time: 3 hours

Maximum Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. Answering the question in **Part-A** is compulsory
 3. Answer any **THREE** Questions from **Part-B**

Design Data book is allowed

PART –A

- 1 a) What is the bearing area for a collar bearing having n collars? [3M]
 b) What stresses are induced in the crank shaft? [4M]
 c) What factors are to be considered with designing a piston? [3M]
 d) What are the beams of large curvature? [4M]
 e) How the angle of wrap influences the performance of belt drive? [4M]
 f) Classify the brackets, hangers and wall boxes. [4M]

PART –B

- 2 a) Formulate the heat generated and dissipated in a journal bearing. [4M]
 b) A shaft is mounted on two roller bearings, which are 350 mm apart. The shaft carries a bevel gear at the middle. At a shaft speed of 900 rpm; the gear forces are: radial load = 10 kN, and thrust load = 3.5 kN. Determine the rated dynamic capacity of the bearing, for a desired life of 10,000 hours. The service factor is 1.5, thrust factor is 0.67 and radial load factor is 0.67. [12M]
- 3 Design an overhung crank shaft with two main bearings and a flywheel in between them for an I.C. engine, single cylinder 0.25 m × 0.30 m. The flywheel weighs 27 kN. The maximum pressure is 2.1 MPa. The torsional moment is maximum when the crank at 35° form the I.D.C, while the pressure is 1.05 MPa. Assume missing data. [16M]
- 4 Design a suitable aluminium alloy piston with two compression rings and one oil ring for a petrol engine of following particulars: [16M]
- | | | |
|--------------------------------|----------|-------------|
| Cylinder | = 0.10 m | |
| Peak gas pressure | | = 3.2 MPa |
| Mean effective pressure | | = 0.8 MPa |
| Average side thrust | | = 2400 N |
| Skirt bearing pressure | | = 0.22 Mpa |
| Bending stress in piston crown | | = 36 MPa |
| Crown temperature difference | | = 70o |
| | | 2 |
| Allowable radial pressure | | = 0.04 MPa |
| Bending stress in rings | | = 90 MPa |
| Heat conductivity, k | | = 160 W/moC |

Draw a full scale dimensioned drawing and indicate the method of reducing the thermal expansion in the skirt of designed piston.



- 5 Horizontal cross-section of a crane hook is a trapezium with parallel sides 26 mm wide at the inside and 13 mm wide at the outside. The parallel sides of the trapezium for the horizontal section are 32 mm apart. The crane hook carries a load P of 5000 N, the line of load being a horizontal distance of 32 mm from the inside edge of the horizontal cross-section through the centre of curvature and the centre of curvature being 38 mm from the same edge. Find the greatest tensile and compressive stresses in the hook. Find the position of neutral axis. Plot the distribution of stress in the horizontal section. What are the stresses if curvature is neglected? [16M]
- 6a) Distinguish between the Square and ACME threads. [4M]
- b) The nominal diameter of a triple threaded square is 50mm, while the pitch is 8mm. It is used with a collar having outer diameter of 100mm and inner diameter 65mm. The coefficient of friction at the thread surface as well as collar surface can be taken as 0.15. The screw is used to raise a load of 15kN. Using uniform wear theory for collar friction, calculate [12M]
- i) torque required to raise the load
- ii) torque required to lowering the load.
- 7 a) What factors are to be considered while designing the levers? [8M]
- b) Sketch and explain the gear tooth terminology. [8M]

