SEVENTH SEMESTER B.Tech DEGREE EXAMINATION

(2013 Scheme)

13.704: ENGINE AND DRIVE LINE DESIGN (U)

Time: 3 Hours Max. Marks: 100

Instructions: *1) Use of design data book is permitted.*
2) Assume missing data if any.

PART- A

(*Answer **all** questions. Each question carries 2 Marks)*

1. Discuss the design procedure of crank shaft for an IC engine.
2. Enlist the various forces acting on connecting rod.
3. What is the importance of Turning moment diagram?
4. What is meant by Bearing Modulus?
5. Compare Dry clutch and Wet clutch.
6. With the help of a neat sketch explain the working of an internal expanding shoe brake.
7. Explain the condition of true rolling in steering wheels.
8. Write short note on Standardization of Gears.
9. Define formative or virtual number of teeth on a helical gear.
10. What is meant by ray diagram?

(10 x 2 = 20 Marks)

PART- B

(*Answer **any one question from each Module**. Each question carries 20 Marks)*

MODULE – I

11. Design a cast iron piston for a single acting four stroke engine with the following data. Cylinder diameter 100mm, stroke 125mm, maximum gas pressure 5N/mm^2, Indicated mean effective pressure 0.75N/mm^2, speed 200 rpm, considering mechanical efficiency of 80% and fuel consumption 0.15 per brake power per hour, assume higher calorific value of fuel as 42 x 10 ^{3} kJ/kg

20 Marks

12. Determine the dimensions of an I section connecting rod for a petrol engine from the following data. Diameter of piston =110 mm, mass of reciprocating parts= 2kg, length of connecting rod

between the centers =325 mm, stroke length= 150 mm, RPM= 1500 with possible over speed of 2500, compression ratio= 4:1 and maximum explosion pressure 2.5 N/mm^2. **20 Marks**

MODULE – II

13. Design a journal bearing for a centrifugal bearing for a centrifugal pump from the following data: load on journal= 20000N, speed of journal = 900 rpm, type of oil is SAE 10, for which the absolute viscosity at 55^0C is 0.017kg/m-s; ambient temperature of oil=15.5 ^{0}C, maximum bearing pressure for the pump = 1.5N/mm^2. Calculate the mass of lubricating oil required for artificial cooling, if rise of temperature of oil is limited to 10^0C. Heat dissipation coefficient = 1232W/$m^2/^0$C.

20 marks

14. Select a single row deep groove ball bearing for a radial load of 400N and an axial load of 5000N, operating at a speed of 1600 rpm for an average life of 5 years at 10 hours per day assuming uniform and steady load. **20 Marks**

MODULE – III

15. A centrifugal clutch is to be designed to transmit 15kW at 900 rpm. The shoes are four in number. The speed at which the engagement begins is ¾th of the running speed. The inner radius of the pulley rim is 150mm.the shoes are lined with a material having coefficient of friction 0.25. Determine mass and sizes of the shoes.

20 marks

16. A flywheel of mass 100kg and radius of gyration 350 mm is rotating at 720 rpm. It is brought to rest by means of a brake. The mass of the brake drum assembly is 5 kg. The brake drum is made of cast iron having specific heat 460 J/kg ^{0}C. Assuming that the total heat generated is absorbed by brake drum only, calculate the temperature rise. **20 marks**

MODULE – IV

17. Design a spur gear drive for a motor shaft is running at 1500 rpm has to transmit 15 kW to a low speed shaft with a speed reduction of 3:1. The teeth are 14 ½ ^{0} involute with 25 teeth on pinion. Both the pinion and gear are made of steel with a maximum safe stress of 200MPa. A safe stress of 40 MPa may be taken for the shaft on which the gear is mounted and for the key.

Assume the starting torque to be 25% higher than the running torque. **20Marks**

18. A pair of helical gears is to transmit 15 kW. The teeth are 20^0 stub in diametral plane and have a helix angle of 45^0. The pinion runs at 10000rpm and has 80 mm pitch diameter. The gear has 320 mm pitch diameter. If the gears are made of cast steel having allowable static strength of 100 MPa; determine a suitable module and face width from static strength considerations and check the gear for wear.

20 Marks

(4 x 20 = 80 Marks)