Hall Ticket Number :										

R-11 / R-13

Code: 1G554

III B.Tech. I Semester Supplementary Examinations October 2020

Design of Machine Elements-I

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1. a) Write a short note on 'Preferred numbers'. 7M
   b) Explain the steps involved in machine design process. 7M
2. a) A machine member is subjected to a bending moment of 3 kNm and a twisting moment of 1.5kNm. Find suitable diameter of the member taking the allowable normal and shear stresses as 120 MPa and 75 MPa respectively. 7M
   b) A steel rod 1.2 meters long has to resist longitudinally an impact of 3 kN that falls on to it from a height of 30 mm. The maximum computed stress is to be limited to 150 MPa. Determine the suitable diameter of the rod. 7M
3. a) Define the following terms:
   (i) Stress concentration(ii) Notch sensitivity 4M
   b) A transmission shaft carries a pulley midway between two bearings. The bending moment at the pulley varies from 200 N-m to 600 N-m, as the torsional moment in the shaft varies from 70 N-m to 200 N-m. The frequencies of variation of bending and torsional moments are equal to the shaft speed. The shaft is made of steel having ultimate strength of 540 MPa and yield strength in tension of 400 MPa. The corrected endurance limit of the shaft is 200 MPa. Determine the diameter of the shaft using a factor of safety of 2. 10M
4. a) Explain the various stresses induced in screwed fastenings due to initial tighting 7M
   b) Two plates of 15 mm thick are connected by a double riveted lap joint with zig-zag riveting. Assume the allowable stress for both rivets and plates as 180 MPa in tensile, 120 MPa in crushing and 60 MPa in shear. Design the joint and find its efficiency. 7M
5. a) A 65 mm diameter solid shaft is to be welded to a flat plate by a fillet weld around the circumference of the shaft. Determine the size of the weld, if the torque on the shaft is 3 kN-m. The allowable shear stress in the weld is 70 MPa. 6M
   b) Explain the procedure for designing an axially loaded unsymmetrical welded joint. 8M
6. a) Why gibs are used in a cotter joint? Explain with the help of a neat sketch the use of a single and double gib. 4M
   b) Design a knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear, and 150 MPa in compression. 10M
7. A solid steel shaft 1200 mm long is simply supported at its ends. It carries a central load of 1200N. The shaft transmits 12 kW at 200 rpm. Find suitable diameter of the shaft taking allowable stresses in tension and shear as 100 MPa and 54 MPa. 14M
8. Design a bushed pin type flexible coupling for connecting a motor shaft to a pump shaft, with following service conditions:
   Power to be transmitted = 40 kW; Speed of the motor shaft = 1000 rpm;
   Diameter of the motor and pump shaft=45 mm; Bearing pressure on the rubber bush=0.7N/mm^2;
   Allowable stress in the pin = 6 MPa;
   Permissible shear stress in the flange material (CI) = 14 MPa;
   Permissible shear stress in the shaft and key material = 45 MPa; and
   Permissible crushing stress in the key material = 100 MPa.
   Draw a neat dimensioned diagram of the coupling. 14M

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Hall Ticket Number :										

R-11 / R-13

Code: 1G552

III B.Tech. I Semester Supplementary Examinations October 2020

Dynamics of Machinery

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1. a) What do you understand by gyroscopic couple? Derive a formula for its magnitude

   b) An aircraft consists of a propeller and engine. The mass moment of inertia of propeller and engine is 100 kg-m^2. The engine rotates at 2500 rpm in clockwise direction, if viewed from the front of the aircraft. The air-craft completes half circle of radius of 1000m, while flying at 500km/hr. Determine the gyroscopic couple on the aircraft and state its effect

2. a) State the laws of static and dynamic friction.

   b) A conical pivot bearing supports a vertical shaft of 200 mm diameter. It is subjected to a load of 30kN. The angle of the cone is 120° and the coefficient of friction is 0.025. Find the power lost in friction when the speed is 140 r.p.m. assuming. (i) Uniform pressure and (ii) Uniform wear

3. a) Describe with a sketch a torsion dynamometer and explain the calculation involved in finding the power transmitted

   b) A Single plate clutch is employed to transmit 40 kW at speed of 2000 rpm. Maximum intensity of pressure at any point of contact is 0.8 bar. The coefficient of friction is 0.30. If the outside diameter of the friction plate is 300 mm, and has both sides effective, determine: (i) the inside diameter of the friction plate and (ii) the axial thrust with which the frictional surfaces are held together.

4. a) Explain the turning moment diagram of a four-stroke cycle internal combustion engine.

   b) The turning moment diagram for a petrol engine is drawn to the following scales:
   Turning moment, 1mm = 5 N-m; crank angle, 1mm = 1°. The turning moment diagram repeats itself at every half revolution of the engine and the areas above and below the mean turning moment line taken in order are 295, 685, 40, 340, 960, 270 mm^2. The rotating parts are equivalent to a mass of 36 kg at a radius of gyration of 150 mm. Determine the coefficient of fluctuation of speed when the engine runs at 1800 r.p.m.

5. In a spring-loaded governor of the Hartnell type, the mass of each ball is 6kg and the lift of the sleeve is 60 mm. The speed at which the governor begins to float is 260rpm and at this speed the radius of the ball path is 120mm. The mean working speed of the governor is 22 times the range of speed when friction is neglected. If the lengths of ball and roller arm of the bell crank lever are 150mm&120mm respectively and if the distance between the center of pivot of bell crank lever & axis of governor spindle is 160mm, determine the initial compression of spring taking in to account the obliquity of arms. If friction is equivalent to a force of 40N at the sleeve, find the total alteration in speed before the sleeve begins to move from mid-position

6. a) Discuss how a single revolving mass is balanced by two masses revolving in different planes.

   b) Explain clearly the terms ‘static balancing’ and ‘dynamic balancing’. State the necessary conditions to achieve them.

7. a) What are the effects of Partial balancing in locomotives

   b) Explain the ‘direct and reverse crank’ method for determining unbalanced forces in radial engines

8. a) Discuss the variation of the Magnification factor with frequency ratio for various amount of damping in a system

   b) A Shaft of diameter 40 mm and 2.5 m long has a mass of 15 kg/m. It is simply supported at ends and carries three masses 90 kg, 140 kg, 60 kg at 0.8 m, 1.5 m, 2 m respectively from the left support. Find the frequency of transverse vibration by using Dun Kerley’s method. Take E= 200G N/m^2

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R-11 / R-13

Code: 1G553

III B.Tech. I Semester Supplementary Examinations October 2020

Machine Tools

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1. a) What is meant by orthogonal cutting and oblique cutting?
   b) Discuss important properties of cutting tool.

2. a) Describe the method of operation of Swiss type automatic lathe, with application & tool used
   b) How automatic lathes are classified

3. a) What is double housing planner? Explain its working.
   b) Differentiate shaper and planner machines.

4. a) Draw and describe various types of reamers
   b) Summarize the working principle of fine boring machine.

5. a) Compare up-cut and down-cut milling process with particular reference to chip Formation and forces induced in component and cutter.
   b) Explain the construction and working of a horizontal milling machine.

6. a) Explain the working of a cylindrical grinding machine with neat a sketch.
   b) Explain the working principle of surface grinder

7. a) Explain the working of a vertical type broaching machine
   b) What is honing process? Explain the methods of honing process?

8. a) Classify different types of jigs.
   b) What are the factors to be considered while designing a jig?

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