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Code: 5G554

III B.Tech. I Semester Supplementary Examinations October 2020

Design of Machine Elements-I

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit (5 x 14 = 70 Marks)

UNIT-I

1. a) Explain the design procedure of machine elements.
- b) Briefly explain various manufacturing considerations in design

OR

2. a) Explain any three theories of failures.
- b) A machine member 50 mm diameter and 200 mm long can be treated as a cantilever for stress analysis. The member is subjected to a combination of the following loads:
 - (i) An axial tensile load of 10 KN.
 - (ii) A transverse point load of 3.5 KN at a distance of 20 mm from free end, and
 - (iii) A torque of 3 KN-m at the free end.

Determine combined stresses at the most critical section.

UNIT-II

3. a) Define fatigue strength. Explain the factors that affect fatigue strength.
- b) What is stress concentration? Give two examples with sketches how to minimize the stress concentration.

OR

4. A hot rolled steel shaft is subjected to a torsional moment that varies from 330 N.m clockwise to 110 N.m counter clockwise and an applied bending moment at a critical section varies from 440N-m to -220 N-m. The shaft is of uniform cross-section and no key way is present at the critical section. Determine the required shaft diameter. The material has an ultimate strength of 550MN/m² and yield strength of 410MN/m². Take the endurance limit as half the ultimate strength, factor of safety of 2, size factor of 0.85 and surface finish factor of 0.62.

UNIT-III

5. a) Explain the various stress induced in screwed fastening due to initial tightening.
- b) A mild steel plate of 10 mm thickness is joined to another plate by a single transverse weld and double parallel fillet welds. Find the width of the plate and length of the welds, if the joint is subjected to a direct tensile force of 50 kN. Take permissible shear stress for the weld as 80 MPa, and tensile stress as 90 MPa. The permissible tensile stress for the plate material is 60 MPa.

OR

6. a) What is an eccentric loaded welded joint? Discuss the procedure for designing such a joint.
- b) A 70 mm diameter solid shaft is to be welded to a plate by means of a fillet weld, around the circumference of the shaft. Determine the size of the weld, if the shaft is subjected to a torque of 4 kN-m. The allowable shear stress in the weld is 45 MPa.
Instead of torque, if the above shaft is subjected to a bending moment of 4 kN-m, determine the size if the weld. The allowable normal stress in the weld is 60 MPa.

UNIT-IV

7. Two rods having 30 mm x 30 mm square cross-section are connected using a gib and cotter. Calculate the leading dimensions of the joint so as to have the strength of the joint same as the strength of the rods in tension. For all the parts of the joint take the allowable stresses as follows: Tensile Strength = 120 N/mm² Shear Strength = 70 N/mm² and Compression strength = 240 N/mm².

OR

8. Design the chain link to withstand a load of 40 KN. Use the following allowable stresses. For links: tensile strength = 60 N/mm² Shear Strength = 35 N/mm² and Compression Strength = 65 N/mm². For Pin: Shear Strength = 30 N/mm² and Bearing Strength = 65 N/mm².

UNIT-V

9. a) Explain the difference between shaft, axle and spindle.
- b) Determine the inside and outside diameters of a hollow shaft which will replace a solid shaft made of the same material and be equally as strong as solid one and also have only half the weight of solid one.

OR

10. Design a bushed pin type flexible coupling to transmit 15 kW at 2000 rpm. Allowable shear stress for shafts, keys and bolts = 55 MPa. Allowable bearing stress for bolts and keys = 110 MPa. Allowable bearing pressure for rubber bush = 1 MPa.

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Code: 5G552

III B.Tech. I Semester Supplementary Examinations October 2020

Dynamics of Machinery

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit (5 x 14 = 70 Marks)

UNIT-I

1. Two tie rods are connected by a turn buckle having right and left threads. The threads are V-type and having a pitch of 5mm on a mean diameter of 30mm and a thread angle of 60° , assuming coefficient of friction as 0.15, find the torque required to produce a pull of 4×10^4 N.

OR

2. A cone clutch with cone angle 20° is to transmit 7.5KW at 750rpm. The normal intensity of pressure between the contact faces is not to exceed 0.12 N/mm^2 . The coefficient of friction is 0.2. If face width is 1/5th of mean diameter, find:
i) The main dimensions of the clutch, and ii) Axial force required while running.

UNIT-II

3. In a band and block Brake, the band is lined with 14 blocks, each of which subtends an angle of 20° at the drum centre. One end of the band is attached to the fulcrum of the brake lever and the other to a pin 150mm from the fulcrum. Find the force required at the end of the lever 1m long from the fulcrum to give a torque of 4k N-m. The diameter of the brake drum is 1m and the coefficient of friction between the blocks and the drum is 0.25.

OR

4. An aeroplane makes a complete half circle of 60m radius to the left when flying at 200kmph. The rotary engine and propeller of the aeroplane weigh 4000N with a radius of gyration 30cm and engine runs at 2500rpm clockwise, when viewed from rear end. Find the gyroscopic couple on the aeroplane and state its effect on it. Show the gyroscopic effect by a sketch.

UNIT-III

5. A flywheel of mass 250 kg and radius of gyration of 600 mm is attached to a shaft. The shaft rotates at a speed of 200 rpm and drives a machine. The torque of the machine varies in a cycle manner over a period of 3 revolutions. The torque rises from 250 Nm to 1000 Nm uniformly during the first half revolution and remains constant for the next one revolution. It then falls uniformly to 250 Nm during the next half revolution and remains constant for the next one revolution, the cycle being repeated thereafter. Determine:
(i). The power required to drive the machine and
(ii). The total fluctuation of speed of the machine shaft.

OR

6. a) Define 'Sensitiveness', 'Isochronism' and 'Stability' of a Governor.
b) In a Hartnell governor, the extreme radii of rotation of the balls are 60 mm and 80 mm, and the corresponding speeds are 240 rpm and 280 rpm. The mass of each ball is 3 kg. The lengths of the ball and the sleeve arms are equal. Determine the initial compression and the constant of the central spring.

UNIT-IV

7. A five cylinder in-line engine running at 750 rpm has successive cranks 144° apart. The distance between the cylinder centre lines is 375 mm. The length of the crank and connecting rod are 100 mm and 400 mm respectively and the reciprocating mass for each cylinder is 15 kg. Examine the engine for balance of primary and secondary forces and couples.

OR

8. a) Explain the terms 'static balancing' and 'dynamic balancing'.
- b) Four masses A, B, C and D revolve at equal radii and are equally spaced along a shaft. The mass B is 7 kg and the radii of C and D make an angles of 90° and 240° respectively with the radius of B. Find the magnitude of the masses A, C and D and the angular position of A so that the system may be completely balanced.

UNIT-V

9. a) Explain the term 'Whirling Speed' of a shaft.
- b) A steel shaft 1.5m long is supported on simply supported bearings at its ends. It carries two rotors, 50 kg each at its one-third points. The shaft is hollow, external diameter is 8 cm and the internal diameter is half of the external diameter. Determine the natural frequency by Dunkerley's method.

OR

10. The moment of inertia of a three rotor system A, B, and C are respectively 100, 225 and 20 $\text{kg}\cdot\text{m}^2$. The distance between A and B is 100 cm and between B and C is 14.1 cm and the shaft is 8 cm diameter. If the modulus of rigidity of the shaft is 80 GN/ m^2 , find the frequencies of the free torsional vibration of the system.

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R-15

Code: 5GA51

III B.Tech. I Semester Supplementary Examinations October 2020

Managerial Economics and Financial Analysis

(Common to CE, ME & ECE)

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit (5 x 14 = 70 Marks)

UNIT-I

1. Define managerial economics? Explain nature and scope. 14M

OR

2. What is demand? State and explain law of demand. Are there any exceptions to the law? 14M

UNIT-II

3. Define cost. Explain the difference types of cost concepts used in the process of cost analysis. 14M

OR

4. State the break even analysis? Explain objectives, importance's and show the graphical representation of BEP. 14M

UNIT-III

5. Evaluate sole trader form of organization 14M

OR

6. Despite the features, advantages and disadvantages of partnership business. 14M

UNIT-IV

7. Define capital? Explain significance, need and types of capital. 14M

OR

8. What is working capital? Explain the factors governing working capital requirements? 14M

UNIT-V

9. Prepare journal entries and ledger accounts from the following 14M
Jan 1 started business with cash Rs 10000
Jan 3 deposit into bank Rs 15000
Jan 10 purchased machinery Rs34000 from jawahar.
Jan 16 sold goods for cash Rs 52000
Jan 20 received cash from business Rs 12000

OR

10. Define ratio analysis? Explain advantages and disadvantage ratio analysis. 14M
