

Code No: R05312401

R05**Set No. 2****III B.Tech I Semester Examinations, November 2010****DESIGN OF MACHINE ELEMENTS****Automobile Engineering****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions****All Questions carry equal marks**

1. (a) Explain the design considerations of castings. Draw neat sketches wherever necessary.
- (b) What is fibre reinforced plastic? What are the advantages of fibre reinforced plastics? [8+8]
2. (a) Specify a leaf spring and indicate the specification in a sketch.
- (b) At the bottom of an elevator shaft a group of 8 identical springs are set in parallel to absorb the shock of the elevator in the case of failure. The elevator Weighs 40 kN. Assuming the elevator has a free fall of 1.5 m from rest, determine the maximum stress if each spring is made of 30 mm diameter rod. For each spring, the spring index is 8 and the number of active coils is 12. Take $G=83\text{GN}/\text{m}^2$. [4+12]
3. (a) What is meant by bolt of uniform strength?
- (b) The cylinder head of a 200 mm \times 350 mm compressor is secured by means of 12 studs of rolled mild steel. The gas pressure is 1.5 N/mm² gauge. The initial tension in the bolts, assumed to be equally loaded such that a cylinder pressure of 3 N/mm² gauge is required for the joint to be on the point of opening. Suggest the suitable size of the studs in accordance with Soderberg's equation assuming the equivalent diameter of the compressed parts to be twice the bolt size and factor of safety 2. The stress concentration factor may be taken as 2.8 and the value of endurance strength for reversed axial loading is half the value of ultimate strength. [4+12]
4. (a) Explain the theories of fatigue failure.
- (b) Determine the value of maximum work load that can be taken up by a simply supported shaft loaded at the centre. Shaft diameter is 5 cm and its span is 80 cm. Transverse load varies from W to 2.8 W. Assume $N_y=1.5$, size factor= 0.85, surface finish factor= 0.90, $S_{ut}=650\text{ N}/\text{mm}^2$, $S_{yt}=50\text{ N}/\text{mm}^2$. [16]
5. Three identical pulleys of 50 cm diameter and weight 500 N are mounted on a line shaft supported on two bearings 4.0 m apart. The pulley 'A' is mounted at 0.30 m to the right of the left hand bearing, and receives 30 kW at 200 rev./min. from a pulley vertically below it. The pulley 'B' is mounted 1.0 m to the right of the left hand bearing and delivers 6 kW to a pulley through a belt drive inclined backward at 45° to the vertical. The remaining power is taken out through another pulley 'C' which is mounted 3.0 m to the right of the left hand bearing and drives a planing machine, the drive being 30° to the right and to the front. The angle of contact for

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all the pulleys can be taken as 180° and co-efficient of friction as 0.30. Determine the shaft diameter. For shaft material $f_s=82.5$ Mpa. Consider keyway effect. [16]

6. Design a suitable connecting rod for a petrol engine. The following data is available:

Piston diameter = 100mm.

Weight of reciprocating parts per cylinder = 2.25kg

Length of the connecting rod, centre to centre = 300mm

Rated rpm of the engine =1800

Compression ratio =6:1

Maximum explosion pressure =3.15MPa

Maximum possible over speed =2400

Bearing pressure for big end =7MPa

Bearing pressure for small end =14MPa

Draw a dimensioned drawing showing provision for lubrication. [16]

7. Explain the following piston troubles and under what conditions they will be experienced :

- (a) Burning of piston crown,
- (b) Seizure of piston,
- (c) Cracking of piston crown and side walls,
- (d) Breaking of piston rings,
- (e) Stocking of piston rings,
- (f) Excessive lub. oil consumption,
- (g) Scuffing of piston rings and cylinder liners. [16]

8. (a) A 75mm journal bearing, 100 mm long is subjected to 2.5 kN at 600 r.p.m. If the room temperature is 24°C . What viscosity of oil should be used to limit the bearing surface temperature at 55°C . $D/C=1000$.
- (b) A roller bearing is selected to withstand a radial load of 40kN and life of 1200 hours at 600 r.p.m. What load rating would you look for in searching from manufacturers catalogue if it specifies load at speed 500 r.p.m and life 3000hours. [8+8]

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1. (a) Specify a leaf spring and indicate the specification in a sketch.
 (b) At the bottom of an elevator shaft a group of 8 identical springs are set in parallel to absorb the shock of the elevator in the case of failure. The elevator Weighs 40 kN. Assuming the elevator has a free fall of 1.5 m from rest, determine the maximum stress if each spring is made of 30 mm diameter rod. For each spring, the spring index is 8 and the number of active coils is 12. Take $G=83\text{GN}/\text{m}^2$. [4+12]
2. (a) Explain the design considerations of castings. Draw neat sketches wherever necessary.
 (b) What is fibre reinforced plastic? What are the advantages of fibre reinforced plastics? [8+8]
3. Explain the following piston troubles and under what conditions they will be experienced :
 (a) Burning of piston crown,
 (b) Seizure of piston,
 (c) Cracking of piston crown and side walls,
 (d) Breaking of piston rings,
 (e) Stocking of piston rings,
 (f) Excessive lub. oil consumption,
 (g) Scuffing of piston rings and cylinder liners. [16]
4. (a) Explain the theories of fatigue failure.
 (b) Determine the value of maximum work load that can be taken up by a simply supported shaft loaded at the centre. Shaft diameter is 5 cm and its span is 80 cm. Transverse load varies from W to 2.8 W. Assume $N_y=1.5$, size factor= 0.85, surface finish factor= 0.90, $S_{ut}=650\text{ N}/\text{mm}^2$, $S_{yt}=50\text{ N}/\text{mm}^2$. [16]
5. (a) What is meant by bolt of uniform strength?
 (b) The cylinder head of a 200 mm \times 350 mm compressor is secured by means of 12 studs of rolled mild steel. The gas pressure is 1.5 N/mm^2 gauge. The initial tension in the bolts, assumed to be equally loaded such that a cylinder pressure of 3 N/mm^2 gauge is required for the joint to be on the point of opening. Suggest the suitable size of the studs in accordance with Soderberg's

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equation assuming the equivalent diameter of the compressed parts to be twice the bolt size and factor of safety 2. The stress concentration factor may be taken as 2.8 and the value of endurance strength for reversed axial loading is half the value of ultimate strength. [4+12]

6. Design a suitable connecting rod for a petrol engine. The following data is available:

Piston diameter = 100mm.

Weight of reciprocating parts per cylinder = 2.25kg

Length of the connecting rod, centre to centre = 300mm

Rated rpm of the engine = 1800

Compression ratio = 6:1

Maximum explosion pressure = 3.15MPa

Maximum possible over speed = 2400

Bearing pressure for big end = 7MPa

Bearing pressure for small end = 14MPa

Draw a dimensioned drawing showing provision for lubrication. [16]

7. (a) A 75mm journal bearing, 100 mm long is subjected to 2.5 kN at 600 r.p.m. If the room temperature is 24°C. What viscosity of oil should be used to limit the bearing surface temperature at 55°C. $D/C=1000$.
- (b) A roller bearing is selected to withstand a radial load of 40kN and life of 1200 hours at 600 r.p.m. What load rating would you look for in searching from manufacturers catalogue if it specifies load at speed 500 r.p.m and life 3000hours. [8+8]
8. Three identical pulleys of 50 cm diameter and weight 500 N are mounted on a line shaft supported on two bearings 4.0 m apart. The pulley 'A' is mounted at 0.30 m to the right of the left hand bearing, and receives 30 kW at 200 rev./min. from a pulley vertically below it. The pulley 'B' is mounted 1.0 m to the right of the left hand bearing and delivers 6 kW to a pulley through a belt drive inclined backward at 45° to the vertical. The remaining power is taken out through another pulley 'C' which is mounted 3.0 m to the right of the left hand bearing and drives a planing machine, the drive being 30° to the right and to the front. The angle of contact for all the pulleys can be taken as 180° and co-efficient of friction as 0.30. Determine the shaft diameter. For shaft material $f_s=82.5$ Mpa. Consider keyway effect. [16]

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R05**Set No. 1****III B.Tech I Semester Examinations, November 2010****DESIGN OF MACHINE ELEMENTS****Automobile Engineering****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions****All Questions carry equal marks**

1. (a) Explain the theories of fatigue failure.
 (b) Determine the value of maximum work load that can be taken up by a simply supported shaft loaded at the centre. Shaft diameter is 5 cm and its span is 80 cm. Transverse load varies from W to $2.8 W$. Assume $N_y = 1.5$, size factor = 0.85, surface finish factor = 0.90, $S_{ut} = 650 \text{ N/mm}^2$, $S_{yt} = 50 \text{ N/mm}^2$. [16]
2. (a) Explain the design considerations of castings. Draw neat sketches wherever necessary.
 (b) What is fibre reinforced plastic? What are the advantages of fibre reinforced plastics? [8+8]
3. (a) What is meant by bolt of uniform strength?
 (b) The cylinder head of a $200 \text{ mm} \times 350 \text{ mm}$ compressor is secured by means of 12 studs of rolled mild steel. The gas pressure is 1.5 N/mm^2 gauge. The initial tension in the bolts, assumed to be equally loaded such that a cylinder pressure of 3 N/mm^2 gauge is required for the joint to be on the point of opening. Suggest the suitable size of the studs in accordance with Soderberg's equation assuming the equivalent diameter of the compressed parts to be twice the bolt size and factor of safety 2. The stress concentration factor may be taken as 2.8 and the value of endurance strength for reversed axial loading is half the value of ultimate strength. [4+12]
4. Three identical pulleys of 50 cm diameter and weight 500 N are mounted on a line shaft supported on two bearings 4.0 m apart. The pulley 'A' is mounted at 0.30 m to the right of the left hand bearing, and receives 30 kW at 200 rev./min. from a pulley vertically below it. The pulley 'B' is mounted 1.0 m to the right of the left hand bearing and delivers 6 kW to a pulley through a belt drive inclined backward at 45° to the vertical. The remaining power is taken out through another pulley 'C' which is mounted 3.0 m to the right of the left hand bearing and drives a planing machine, the drive being 30° to the right and to the front. The angle of contact for all the pulleys can be taken as 180° and co-efficient of friction as 0.30. Determine the shaft diameter. For shaft material $f_s = 82.5 \text{ Mpa}$. Consider keyway effect. [16]
5. (a) Specify a leaf spring and indicate the specification in a sketch.
 (b) At the bottom of an elevator shaft a group of 8 identical springs are set in parallel to absorb the shock of the elevator in the case of failure. The elevator Weighs 40 kN. Assuming the elevator has a free fall of 1.5 m from rest, determine the maximum stress if each spring is made of 30 mm diameter

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rod. For each spring, the spring index is 8 and the number of active coils is 12. Take $G=83\text{GN}/\text{m}^2$. [4+12]

6. Explain the following piston troubles and under what conditions they will be experienced :

- (a) Burning of piston crown,
- (b) Seizure of piston,
- (c) Cracking of piston crown and side walls,
- (d) Breaking of piston rings,
- (e) Stocking of piston rings,
- (f) Excessive lub. oil consumption,
- (g) Scuffing of piston rings and cylinder liners. [16]

7. (a) A 75mm journal bearing, 100 mm long is subjected to 2.5 kN at 600 r.p.m. If the room temperature is 24°C . What viscosity of oil should be used to limit the bearing surface temperature at 55°C . $D/C=1000$.
- (b) A roller bearing is selected to withstand a radial load of 40kN and life of 1200 hours at 600 r.p.m. What load rating would you look for in searching from manufacturers catalogue if it specifies load at speed 500 r.p.m and life 3000hours. [8+8]

8. Design a suitable connecting rod for a petrol engine. The following data is available:

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Length of the connecting rod, centre to centre = 300mm

Rated rpm of the engine = 1800

Compression ratio = 6:1

Maximum explosion pressure = 3.15MPa

Maximum possible over speed = 2400

Bearing pressure for big end = 7MPa

Bearing pressure for small end = 14MPa

Draw a dimensioned drawing showing provision for lubrication. [16]

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R05**Set No. 3****III B.Tech I Semester Examinations, November 2010****DESIGN OF MACHINE ELEMENTS****Automobile Engineering****Time: 3 hours****Max Marks: 80**

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1. Explain the following piston troubles and under what conditions they will be experienced :
 - (a) Burning of piston crown,
 - (b) Seizure of piston,
 - (c) Cracking of piston crown and side walls,
 - (d) Breaking of piston rings,
 - (e) Stocking of piston rings,
 - (f) Excessive lub. oil consumption,
 - (g) Scuffing of piston rings and cylinder liners. [16]
2. (a) Explain the theories of fatigue failure.
 (b) Determine the value of maximum work load that can be taken up by a simply supported shaft loaded at the centre. Shaft diameter is 5 cm and its span is 80 cm. Transverse load varies from W to $2.8W$. Assume $N_y = 1.5$, size factor = 0.85, surface finish factor = 0.90, $S_{ut} = 650 \text{ N/mm}^2$, $S_{yt} = 50 \text{ N/mm}^2$. [16]
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 (b) A roller bearing is selected to withstand a radial load of 40kN and life of 1200 hours at 600 r.p.m. What load rating would you look for in searching from manufacturers catalogue if it specifies load at speed 500 r.p.m and life 3000hours. [8+8]
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5. (a) What is meant by bolt of uniform strength?

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- (b) The cylinder head of a 200 mm \times 350 mm compressor is secured by means of 12 studs of rolled mild steel. The gas pressure is 1.5 N/mm² gauge. The initial tension in the bolts, assumed to be equally loaded such that a cylinder pressure of 3 N/mm² gauge is required for the joint to be on the point of opening. Suggest the suitable size of the studs in accordance with Soderberg's equation assuming the equivalent diameter of the compressed parts to be twice the bolt size and factor of safety 2. The stress concentration factor may be taken as 2.8 and the value of endurance strength for reversed axial loading is half the value of ultimate strength. [4+12]
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 Weight of reciprocating parts per cylinder = 2.25kg
 Length of the connecting rod, centre to centre = 300mm
 Rated rpm of the engine = 1800
 Compression ratio = 6:1
 Maximum explosion pressure = 3.15MPa
 Maximum possible over speed = 2400
 Bearing pressure for big end = 7MPa
 Bearing pressure for small end = 14MPa
 Draw a dimensioned drawing showing provision for lubrication. [16]
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