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AU – 2848

Seventh Semester B. E. (Mechanical Engineering) Examination

MACHINE DESIGN AND DRAWING – II

Paper – 7 ME 01

(USC – 10870)

P. Pages : 4

Time : Four Hours] [Max. Marks : 80

Note : (1) Separate answer book must be used for each section in the subject Geology, Engineering material of Civil branch and separate answer book must be used for Section A and B in pharmacy and Cosmetic Tech.
(2) All questions carry equal marks.
(3) Answer **Two** questions from Section A and **Two** questions from Section B.
(4) Due credit will be given to neatness and adequate dimensions.
(5) Assume suitable data wherever necessary.
(6) Use of Design Data book is permitted.
(7) Use pen of Blue / Black ink / refill only for writing the answer book.

SECTION A

1. (a) A Horizontal piece of shaft is supported by bearings 1.6 m apart. A gear 20^0 involute and 190 mm diameter is located at 460 mm to the left of right hand bearing and is driven by a gear directly behind it. A pully of 600 mm diameter is keyed to the shaft at 500 mm at right to the left hand bearing and drives a pully directly behind it. For this belt tension ratio is 3 with tight side of bottom shaft transmits 40 kW at 520 rpm. Permissible shear stresses for shaft material is 50 MPa and bending stresses 68 MPa. Km = Kt = 1.32. Find the required diamer of shaft. 17

   (b) Why tapper is provided to the flywheel arms ? 3

OR

2. (a) A punching machine makes 24 working strokes per minute. Machine is capable of punching 30 mm diameter holes in 20 mm thick steel plate having ultimate shear strength 370 MPa. Punching operation takes place during

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$1/10^{th}$ revolution of crankshaft. Find power required for driving the motor assuming machine's mechanical efficiency 73%. Also determine suitable dimensions of rim cross section of flywheel which revolve at 9 times the speed of crank shaft. Coefficient of fluctuation of speed is 0.42. Flywheel is of Cast Iron having density $7250\,kg/cm^3$ and tensile stress of 8 MPa. Diameter of flywheel should not exceed 1.06 m. Hub and arms provide 10% rotational interia. 16

(b) What is the difference amongest shaft, axle and spindle ? 4

3. (a) A belt drive consist of two V belts in parallel on grooved pulleys of same size. Groove angle is 30^0. Cross section area of each belt is 710 mm^2 and $\mu = 0.21$. Density of belt material is $1150\,kg/m^3$. Maximum permissible tensile stress of belt material is 8 MPa. Calculate power that can be transmitted between the pulleys of 300 mm diameter rotating at 1400 rpm. Also find the shaft speed in rpm at which power transmitted would be maximum. 16

(b) Explain with the help of neat sketch the construction of roller chain. 4

OR

4. (a) Select single row deep groove ball bearing to support the shaft rotating at 620 rpm. Expected Life of bearing is 4 years if shift is of 7 hours per day. Axial and radial loads on bearings are 2500 N and 4400 N respectively. Outer race of bearing is not stationary. Bearing is subjected to light shocks. 10

(b) Select the wire rope of 6x19 type to lift the load of 6.5kN from the depth of 120m. Rope speed of 400m/min is to be attained in 12 seconds. Modulus of elasticity of rope material is $84000\,N/mm^2$. Show that selected wire rope is safe during starting stopping, during normal working and during accelaration. 10

SECTION B

5. (a) Specifications for spur gear drive is as below :—

- Power transmission = 17.2 KW

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- Speed of gears = 1000 rpm and 250 rpm
- Pressure angle = 14.5^0 (involute)
- Static stress for gear = 110 MPa
- Static stress for pinion = 135 MPa
- Face width = 11 times module
- Service factor = 1.2
- Velocity factor

$$Cv = \frac{270}{270 + \vartheta} \text{ where } \vartheta \text{ is in m / min}$$

- Centre distance = 600 mm

find the

(i) module (ii) face width (iii) diameters.

Also check the gears for wear load. 16

(b) Why generally strong material is prepared for pinion ? 4

OR

6. (a) How the bevel gears are classified ? Explain with neat sketches. 4

(b) A pair of helical gears are to transmit 17.5 kW. Teeth are 20^0 stub having helix angle 35^0. Pinion runs at 8000 rpm and has 75 mm PCD. Gear has 350 mm PCD. Both gears are made of steel having allowable static strength 100 MPa. Face width is three times the Normal pitch.
Detemine :—

(i) Module

(ii) Face width

(iii) Number of teeth

(iv) Axial force

Also check the gears for wear load. 16

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7. (a) Determine :—

(i) Bore and length of cylinder

(ii) Thickness of cylinder head

(iii) Size of stud for cylinder head

For four stroke diesel engine having following specifications :—

- Brake power 8 kW
- Speed = 1600 rpm
- Indicated mean effective pressure = 0.32 N/mm^2
- Mechanical efficiency = 72% 15

(b) Prove that connecting rod I_{XX} is less than four times I_{YY}. 5

OR

8. (a) Design piston for single acting four stroke engine for following specifications :—

Cylinder bore = 105 mm

Stroke = 130 mm

Max gas pressure = 5.3 N/mm^2

Indicated mean effective pressure = 0.75 N / mm^2

Mechanical efficiency = 78%

Fuel consumption = 0.15 kg / BP / hr

HCV of Fuel = 42 MJ / kg

Speed = 1800 rpm

Assume suitable data if required. 16

(b) Discuss the various stresses developed in connecting rod. 4

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