

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VIII EXAMINATION – SUMMER 2016****Subject Code:181902****Date:05/05/2016****Subject Name:Machine Design II****Time:10:30 AM to 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Write a detailed note on selection of gear materials in detail. **05**
- (b)** Design (draw only structural diagram and speed chart) a speed gearbox for the following specifications for a head stock of a lathe machine: **09**
- Motor Power = 10 Kw;
 Gearbox input shaft speed = 500 r.p.m.
 Maximum speed = 630 r.p.m.;
 Minimum speed = 100 r.p.m.
 No. of step = 9

- Q.2 (a)** Explain the effect of helix angle on power transmission capacity of helical gear. Also suggest the values of helix angle for helical gear. **05**
- (b)** A pair of helical gears is used in a speed reducer, driven by an I.C. engine. Pinion transmits 50 kW at 1000 r.p.m. The speed reduction is 4 : 1. Design the gear pair assuming service load factor of 1.875 for medium shock condition and continuous operation. Lewis's form factor $Y = \pi [0.154 - 0.912/Z]$ and $\sigma_{en} = 384$ MPa. The other details are as below: **09**

Material	σ_b MPa	BHN
Pinion C30 forged steel	175	150
Gear cast steel	140	180

OR

- (b)** The following data refers to a spur gear pair: **09**

	pinion	gear
Material	C-50 steel	C35 Mn75 steel
Ultimate strength	700 MPa	600 MPa
BHN	240	225
Pitch diameter	48 mm	144 mm
No of teeth	24	72 (20° full depth)
RPM	1440	480

Service factor = 1.5

Dynamic load factor = 230 N/mm

Lewis's form factor $Y = \pi [0.154 - 0.912/Z]$ Velocity factor = $3 / (3 + v)$ Wear factor = $0.156 [BHN / 100]^2$ MPa

Specify the kW capacity of the gear unit.

- Q.3 (a)** Explain the thermal consideration in worm and worm gears in detail. **05**

- (b) Design the pair of 90° straight bevel gear is used to transmit 7.5 kW from the motor running at 1440 r.p.m. from the given data: **09**
 Speed reduction = 4 : 1
 No of teeth on pinion = 18
 Pressure angle = 20° full depth
 Design stress for C.I. gears = 55 MPa
 Stress concentration factor = 1.1
 service load factor = 1.5
 $\sigma_{es} = 550$ MPa and take $E_p = E_g = 2.0 \times 10^5$ N/mm²
- OR**
- Q.3 (a)** Explain the various gear tooth failures alongwith stating reasons and its remedies in detail. **05**
(b) The following data refers to a worm gear : **09**
 Power = 15 kw
 Speed of worm = 1200 rpm
 Teeth on worm gear = 36 (20° full depth)
 Tripple threaded worm
 Axial pitch of the worm = 30 mm
 Pitch diameter of worm = 60 mm
 Coefficient of friction = 0.03
 Find 1) helix angle of worm 2) speed ratio 3) center distance between two shafts 4) apparent stress in the worm gear 5) efficiency of drive.
- Q.4 (a)** Explain the design of cylinder of an I.C. engine. **05**
(b) Design a connecting rod for a single cylinder I.C. engine from the following data: **09**
 Diameter of piston = 100 mm Mass of reciprocating parts = 2.25 kg
 Length of connecting rod = 300 mm; Stroke = 125 mm
 Speed = 1500 rpm
 Compression ratio = 6 Factor of safety = 7
 Maximum explosion pressure = 3.5 MPa
 For connecting rod material, yield stress in compression = 330 MPa.
 Density of connecting rod material = 8000 kg/m³
 Permissible whipping stress for connecting rod material = 20 MPa.
 Take size of connecting rod as 5t x 4t x t.
- OR**
- Q.4 (a)** Explain the valves gears mechanism used in an I.C. engine with neat sketch. **05**
(b) Design a cast iron piston for a four stroke I.C. engine from the following specification : **09**
 Cylinder Bore = 110 mm Stroke = 120 mm
 Maximum gas pressure = 5 N/mm² Speed = 2000 rev/min.
 Indicated mean effective pressure = 0.75 N/mm²
 Fuel consumption = 0.15 kg/BHP/hr,
 Mechanical efficiency = 80 %
 For C.I piston ,permissible tensile stress = 35 N/mm²
 HCV=42000 KJ/kg, K for C.I. = 46.6 W/m⁰c
 Take $T_c - T_e = 220^\circ$ c
 Permissible tensile stress for piston ring = 80 N/mm²
 Permissible bending stress for pin = 85 N/mm²
 Permissible bearing stress for pin = 20 N/mm²
- Q.5 (a)** Explain the design of belt conveyors / screw conveyors with a neat sketch. **05**

- (b) Design the crane hook for a maximum load lifting capacity of 100 kN . The material for hook is forged steel with permissible tensile stress 120 N/mm^2 . Select the most suitable cross section for the hook. **09**

OR

- Q.5** (a) Explain the basic Concepts of material handling system design in detail. **05**
(b) State the main parts commonly used in materials handling equipments alongwith neat sketch. Explain the design of drum and selection of suitable wire rope in detail. **09**
