A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 96A02A

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2023

Sixth semester

Agriculture Engineering

19UAG602- Design of Agriculture machinery

(Regulation 2019)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The Centroidal axis and nutral axis are not co-incident is called CO1- U

   (a) Straight beam (b) cantilever beam (c) fixed beam (d) curved beam

2. Stress is defined as the ratio of CO1- U

   (a) Load to area (b) pressure to area (c) load to volume (d) pressure to volume

3. Which one of the following drives is used without slipping CO1- U

   (a) V belt (b) flat belt (c) cone pulley (d) Chain drive

4. The groove angle for rope is CO1- U

   (a) 35º (b) 40º (c) 25º (d) 45º

5. The elements which joints the two shaft is called CO1- U

   (a) couplings (b)key (a) couplings (b)key

6. If the given shear stress/ bending stress is more than determined value, the design is CO1- U

   (a) not safe (b) moderate (a) not safe (b) moderate

7. A device which deflects or distorts under the action of load is called CO1- U

   (a) shaft (b) spline (c)key (d) spring

8. Stiffness of spring is the ratio of CO1- U

   (a) load/ deflection (b) deflection/ load

   (c)deflection/pressure (d) pressure/ deflection

9. The ratio of the pitch circle diameter to the number of teeth is called CO1- R

(a) diametral pitch (b) pitch circle (c) module (d) circular pitch

10 A machine part, which support a moving element and confines its motion CO1- R

(a) bearings (b) shaft (c) gear (d) clutch

PART – B (5 x 2= 10 Marks)

11 Give the uses of Goodman & Soderberg diagrams. CO1- U

12 Name the few material for belt drives CO1- U

13 Describe the whirling speed of the shaft. CO2- App

14 State the application of springs in daily usages. CO1- U

15 State the disadvantages of gear drive CO1- U

PART – C (5 x 16= 80 Marks)

16 (a) The piston of a reciprocating compressor has a diameter of 70 mm. the maximum pressure on the piston fall is 1.25 MN/ m^2. Assuming the gudegon pin passing through the small end of the connecting rod can be safely loaded in shear upto 20 M/m^2. Evaluate the minimum diameter of the gudgeon pin. CO3- App (16)

Or

(b) An electric motor weighing 800 N is mounted on a short cantilever beam of uniform rectangular cross section.the weight of motor acts at a distance of 300 mm from the support. The depth of the section is twice the width. Determine the cross section of the beam. Take alloable stress in the beam is 20 N/mm^2 CO6- E (16)

17 (a) A 7.5 KW electric motor running at 1400rpm is used to drive the input shaft of the gear box of a special purpose machine. Design a suitable roller chain to connect the motor shaft to the gear box shaft to give an exact speed ratio of 10 to 1. Assume the minimum centre distance between driver and driven shaft as 600 rpm. CO6- E (16)

Or

(b) A pulley of 800 mm diameter revolving at 180 rpm is to transmit 7.5 kW. Find the width of the leather belt, if the maximum tension is not exceed 145 N in 10 mm width. The tension of the tight side is twice that at the slack side. Evaluate the diameter of the shaft and the dimensions of the various parts of the pulley assuming it have six arms. Maximum shear stress is not exceeds 63 MN/m^2 CO6- E (16)

18	(a)	A shaft of 1000 mm long is subjected to shear stress of 60 MPa and has an angle of twist is equal to 0.017 radian. Determine the diameter of the shaft. Take G= 0.8×10^5 MPa.	CO3- App	(16)
		Or		
	(b)	Examine and Design a muff or sleeve couplings for a shaft to transmit 35 kw at 350 rpm. The safe shear stress for the steel shaft is 60 N/mm2 and fr the cast iron muff is 16 N/mm2. The allowable shear and crushing stresses for the key material are 50 and 150 N/ mm2.	CO3- App	(16)
19	(a)	A helical valve spring is to be designed for an operating load range of 90N to 135 N. the deflection of the spring for this load range is 7.5 mm. Assuming a spring index of 10. A permissible shear stress of 480 N/mm2 and modulus of rigidity of 0.85×10^5 N/mm^2 for the material. Determine the dimensions of the spring.	CO3- App	(16)
		Or		
	(b)	A helical tension spring is used in printing machinery requires a preload of 40 N. the wire diameter of spring is 5 mm. with spring index is 5. The spring has 18 coils. The maximum permissible shear stress for the spring is 420 MPa and modulus of rigidity is 84 kN/mm^2. Determine (i) The initial torsional shear stress in the wire. (ii) The spring index (iii) The spring rate (iv) The spring deflection corresponding to the load found.	CO3-App	(16)
20	(a)	The following particulars of a single reduction spur gear are given: Gear ratio = 9: 1; Distance between centers = 700 mm approximately; Pinion transmits 550 kW at 2000 r.p.m.; Involute teeth of standard proportions (addendum =m) with pressure angle of 22.5°; Permissible normal pressure between teeth = 175 N per mm of width. Find : 1. The nearest standard module if no interference is to occur; 2. The number of teeth on each wheel; 3. The necessary width of the pinion; and 4. The load on the bearings of the wheels due to power transmitted.	CO6- E	(16)
		Or		

(b) Design a journal bearing for a centrifugal pump from the following data: CO6- E (16)

- Load on the journal = 20 kN
- Speed of the journal = 900 rpm
- Type of oil = SAE 10
- Absolute viscosity at 55 º C = 0.017 kg/m-s
- Ambient temperature oil = 15.5 º C
- Maximum bearing pressure = 1.5 MPa
- Rise of temperature of oil = 10 º C

Heat dissipation coefficient = 1232 W/m^2/ º C