Unit 10 - Week 8

Assignment 8

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-04-22, 23:59 IST.

DATA: (For questions 1 to 9)

In three identical (special purpose) vehicles with differential in rear wheels, (A) the first one is fitted with a conventional differential (CD) unit (Fig.-1) with the differential side gears and differential pinions are of equal size (i.e., $Z_1 = Z_2 = Z_3 = Z_4$ Ref. Lecture No. 41), (B) the second one is fitted with a harmonic drive (HDD) unit (Fig.-2), as differential, with Circular Spline (CS) of number of teeth 20, Flex Spline (FS) of number of teeth 18, (C) the third one is fitted with a Reverted gearing (RGD) unit (Fig.-3), as differential, with ideal transmission ratios +10.5 and -9.5. Let in case of CD i.e., case (A) the input to differential unit has the hypoid pinion and gear of 12 and 61 teeth respectively. In all three cases the input [the hypoid pinion in case (A) i.e., CD, the cam in case of (B) i.e., HDD and the planet carrier pulley in case of (C) i.e. RGD] rotates at 100 rpm. In each vehicle the output axle shafts are coupled to two rear wheels of 0.5 meter diameter at 1.2 meter apart. With reference to these specifications solve the followings:-

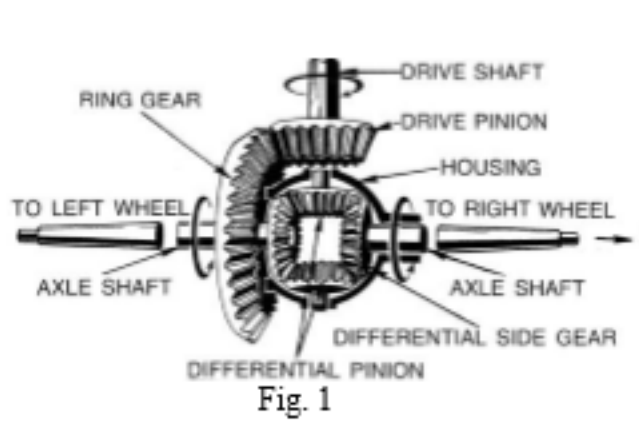

Fig. 1

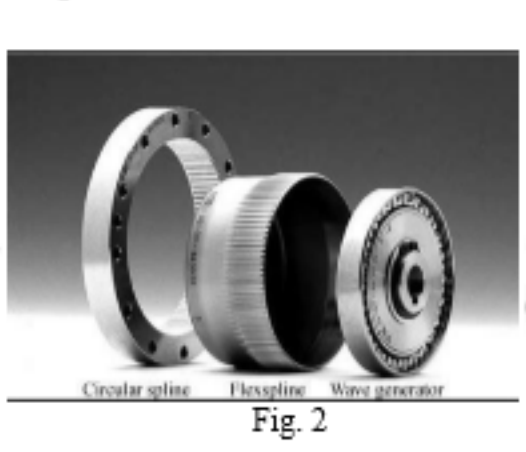

Fig. 2

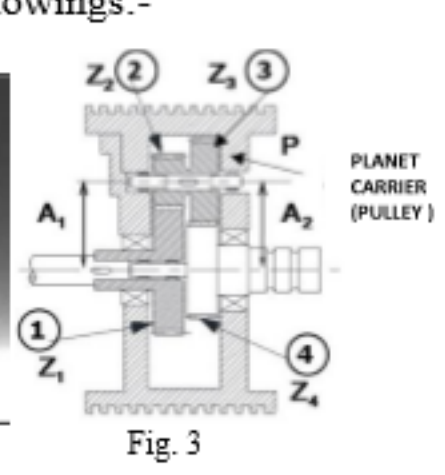

Fig. 3

1) With the conventional differential (CD) unit, when the vehicle moves straight then the velocity of the vehicle in (km/hr) is close to or equals to: *1 point*

a. 6.4247
b. 7.4247
c. 8.4247
d. 9.4247

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
d.

2) With the Harmonic drive (HDD) unit, when the vehicle moves straight then the velocity of the vehicle in (km/hr) is close to or equals to: *1 point*

a. 8.4247
b. 9.4247
c. 10.4247
d. 11.4247

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
b.

3) With the Reverted gearing (RGD) unit, when the vehicle moves straight then the velocity of the vehicle in (km/hr) is close to or equals to: *1 point*

a. 7.4247
b. 8.4247
c. 9.4247
d. 10.4247

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
c.

4) With the CD unit, the maximum angular speed (N_{max} in rpm) of the wheel, when it is turning, is close to or equals to: *1 point*

a. 200
b. 150
c. 100
d. 50

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
a.

5) With the HDD unit, the maximum angular speed (N_{max} in rpm) of the wheel, when it turning, is close to or equals to: *1 point*

a. 11.111
b. 10.111
c. 9.111
d. 8.111

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
a.

6) With the RGD unit, the maximum angular speed (N_{max} in rpm) of the wheel, when it turning is close to or equals to: *1 point*

a. 11.526
b. 10.526
c. 9.526
d. 8.526

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
b.

7) With the CD unit, the maximum rolling speed (V_{max} in m/sec) of the wheel, when it turning, is close to or equals to : *1 point*

a. 7.236
b. 6.236
c. 5.236
d. 4.236

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
c.

8) With the HDD unit, the maximum rolling speed (V_{max} in m/sec) of the wheel, when it turning, is close to or equals to : *1 point*

a. 0.19
b. 0.29
c. 0.39
d. 0.49

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
b.

9) With the RGD unit, the maximum rolling speed (V_{max} in m/sec) of the wheel, when it turning, is close to or equals to : *1 point*

a. 0.575
b. 0.475
c. 0.375
d. 0.275

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
d.

DATA: (For questions 10 to 11)

Consider a reverted gear drive unit with the specification as follows:

Fig. 3

10) the exact values of transmission ratios (Note that $Z_2 < Z_3$ and teeth number is an integer) close to the transmission ratios of i_1= -19.5 and i_2= +20.5 are [Hints: All teeth numbers are close to the summation of the magnitudes of two transmission ratios, i.e., hit and trial may be started by considering one of the Z is (20.5+19.5) =40. Please note that three solutions may be available - (A) ratios are exact, (B) with ratios are slightly higher and (C) ratios are slightly less than the considered ratios.] *1 point*

a. -19.64, +20.64
b. -19.74, +20.74
c. -19.54, +20.54
d. -19.84, +20.84

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
b.

11) The numbers of teeth of gears in reverted gearing for the chosen transmission ratios in solution (i), which are close to i_1= -19.5 and i_2= +20.5, may be taken as *1 point*

a. $Z_1 = 42$; $Z_2 = 39$; $Z_3 = 40$; $Z_4 = 41$
b. $Z_1 = 43$; $Z_2 = 40$; $Z_3 = 41$; $Z_4 = 42$
c. $Z_1 = 44$; $Z_2 = 41$; $Z_3 = 42$; $Z_4 = 43$
d. $Z_1 = 45$; $Z_2 = 42$; $Z_3 = 43$; $Z_4 = 44$

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
a.

DATA: (For questions 12 to 16)

A 2x3 ray type six speeds machine tools change speed gear box is to be designed having minimum output speed between 147 to 153 rpm and maximum output speed 995 to 1005 rpm, (which is also the output speed of the drive motor). Then estimate the followings. :[Hints: Consider the average minimum and maximum output speed for all solutions].

12) For getting the six speeds in GP series the ideal gear ratios would be close to or equals to: *1 point*

a. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.46144$; $Z_{C'}/Z_C = 2.1358$; $Z_{D'}/Z_D = 3.12137$
b. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.56144$; $Z_{C'}/Z_C = 2.2358$; $Z_{D'}/Z_D = 3.22137$
c. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.66144$; $Z_{C'}/Z_C = 2.3358$; $Z_{D'}/Z_D = 3.32137$
d. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.76144$; $Z_{C'}/Z_C = 2.4358$; $Z_{D'}/Z_D = 3.42137$

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
a.

13) For getting the six speeds close to that in GP series the best set of gears are: *1 point*

a. $Z_A = 43$; $Z_B = 34$; $Z_{B'} = 52$; $Z_C = 28$; $Z_{C'} = 58$; $Z_D = 24$; $Z_{D'} = 62$,
b. $Z_A = 41$; $Z_B = 33$; $Z_{B'} = 49$; $Z_C = 26$; $Z_{C'} = 56$; $Z_D = 20$; $Z_{D'} = 62$,
c. $Z_A = 42$; $Z_B = 34$; $Z_{B'} = 50$; $Z_C = 27$; $Z_{C'} = 57$; $Z_D = 22$; $Z_{D'} = 62$,
d. $Z_A = 40$; $Z_B = 32$; $Z_{B'} = 48$; $Z_C = 25$; $Z_{C'} = 55$; $Z_D = 20$; $Z_{D'} = 60$.

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
b.

14) The real gear ratios are: *1 point*

a. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.3848$; $Z_{C'}/Z_C = 2.0538$; $Z_{D'}/Z_D = 3.0$
b. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.5848$; $Z_{C'}/Z_C = 2.2538$; $Z_{D'}/Z_D = 3.2$
c. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.4848$; $Z_{C'}/Z_C = 2.1538$; $Z_{D'}/Z_D = 3.1$,
d. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.6848$; $Z_{C'}/Z_C = 2.3538$; $Z_{D'}/Z_D = 3.3$

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
c.

15) The ideal speeds (rpm) are close to: *1 point*

a. 150; 213.2; 314.37; 462.2; 678.26; 1000
b. 150; 215.2; 316.37; 464.2; 680.26; 1000,
c. 150; 217.2; 318.37; 466.2; 682.26; 1000
d. 150; 219.2; 320.37; 468.2; 684.26; 1000

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
d.

16) The real speeds (rpm) are: *1 point*

a. 148.77; 215.248; 320.58; 462.2857; 671.47; 1000,
b. 149.77; 217.248; 322.58; 464.2857; 673.47; 1000,
c. 150.77; 219.248; 324.58; 466.2857; 675.47; 1000,
d. 151.77; 221.248; 326.58; 468.2857; 677.47; 1000

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
b.

DATA: (For questions 17 to 20)

Now consider 3x2 ray type six speeds machine tools change speed gear box, having minimum output speed between 147 to 153 rpm and maximum output speed 995 to 1005 rpm (which is also the output speed of the drive motor) for the machine tool. Then estimate the followings. :[Hints: Consider the average minimum and maximum output speed for all solutions].

17) For getting the six speeds in GP series the ideal gear ratios would be close to or equals to: *1 point*

a. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.46144$; $Z_{C'}/Z_C = 2.1358$; $Z_{D'}/Z_D = 4.5617$
b. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.56144$; $Z_{C'}/Z_C = 2.2358$; $Z_{D'}/Z_D = 4.6617$
c. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.66144$; $Z_{C'}/Z_C = 2.3358$; $Z_{D'}/Z_D = 4.7617$
d. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.76144$; $Z_{C'}/Z_C = 2.4358$; $Z_{D'}/Z_D = 4.8617$

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
a.

18) For getting the six speeds close to that in GP series the best set of gears are: *1 point*

a. $Z_A = 54$; $Z_B = 44$; $Z_{B'} = 64$; $Z_C = 34$; $Z_{C'} = 74$; $Z_D = 18$; $Z_{D'} = 90$,
b. $Z_A = 55$; $Z_B = 45$; $Z_{B'} = 65$; $Z_C = 35$; $Z_{C'} = 75$; $Z_D = 19$; $Z_{D'} = 91$,
c. $Z_A = 57$; $Z_B = 47$; $Z_{B'} = 67$; $Z_C = 37$; $Z_{C'} = 77$; $Z_D = 21$; $Z_{D'} = 93$,
d. $Z_A = 56$; $Z_B = 46$; $Z_{B'} = 66$; $Z_C = 36$; $Z_{C'} = 76$; $Z_D = 20$; $Z_{D'} = 92$.

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
d.

19) The real gear ratios are: *1 point*

a. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.13478$; $Z_{C'}/Z_C = 2.4111$; $Z_{D'}/Z_D = 4.3$,
b. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.23478$; $Z_{C'}/Z_C = 2.3111$; $Z_{D'}/Z_D = 4.4$,
c. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.33478$; $Z_{C'}/Z_C = 2.2111$; $Z_{D'}/Z_D = 4.5$,
d. $Z_{A'}/Z_A = 1$; $Z_{B'}/Z_B = 1.43478$; $Z_{C'}/Z_C = 2.1111$; $Z_{D'}/Z_D = 4.6$,

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
d.

20) The real speeds (rpm) are: *1 point*

a. 151.515; 217.391; 330.1435; 473.684; 696.97; 1000.
b. 152.515; 218.391; 331.1435; 474.684; 697.97; 1000,
c. 153.515; 219.391; 332.1435; 475.684; 698.97; 1000,
d. 154.515; 220.391; 333.1435; 476.684; 699.97; 1000

- a.
- b.
- c.
- d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
a.