



PRESIDENCY UNIVERSITY

BENGALURU

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End - Term Examinations – May / June 2026

Date: 27-05-2026

Time: 01:00pm – 04:00pm

School: SOE	Program: B. Tech	
Course Code: MEC4007	Course Name: DESIGN OF MACHINE ELEMENTS - II	
Semester: VI	Max Marks: 100	Weightage: 50%

CO - Levels	C01	C02	C03	C04	C05	C06
Marks	17	17	19	19	24	4

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.
- (iii) Use of Databook is allowed

Part A

Answer ALL the Questions. Each question carries 2marks.

10Q x 2M=20M

1.	What is the significance of the cross-sectional area in selecting a V-belt?	2 Marks	L1	C01
2.	Define the term "spring index" for a helical spring.	2 Marks	L1	C03
3.	Explain the importance of pre-stressing in the leaf spring?	2 Marks	L2	C03
4.	Give some suggestions to minimize wear in chain and sprockets?	2 Marks	L1	C02
5.	What is the significance of the pressure angle in gear design?	2 Marks	L1	C04
6.	Explain importance of the line of contact and pitch angles in bevel gears?	2 Marks	L2	C05
7.	Explain Buckingham's equation and its importance in designing a gear?	2 Marks	L2	C04
8.	Give some design considerations for selecting a worm gear?	2 Marks	L1	C05
9.	Explain the term heat generation in braking system?	2 Marks	L1	C06
10.	Classify different types of brakes and clutches?	2 Marks	L2	C06

Part B

Answer the Questions.

Total Marks 80M

11.	A belt is required to transmit 18.5 kW power from the pulley of 1.2 m diameter running at 250 rpm to another pulley which runs at 500 rpm. The distance between the centers of the pulley is 2.7 m. The following data refers to an open belt drive $\mu = 0.25$, safe working stress for the leather is 1.75 N/mm^2 , the thickness of the belt is 0.1 cm. Determine the width and length of the belt considering centrifugal tension into account. Also, find the initial tension in the belt, absolute power that can be transmitted by the belt and the speed at which it can be transmitted.	15 Marks	L3	CO1
Or				
12.	A 50 kW, 1440 rpm motor is required to drive an air compressor through the medium of V- Belting. The diameter of motor and compressor pulleys are respectively 250 mm and 800 mm. The approximate. Select the suitable V-belts and of power is to be transmitted is 1440 rpm to a 400-rpm blower fan air conditioning unit. Select suitable type.	15 Marks	L3	CO1
13.	A roller chain is to designed to transmit 7.5kW from a shaft running at 500 rpm to another shaft running at 900 rpm. Determine: i) pitch of the chain and its chain number, ii) number of teeth on sprockets, iii) pitch diameter of sprockets, iv) shortest distance between them. v) number of chains required.	15 Marks	L3	CO2
Or				
14.	A chain drive is used to increase the speed from 120 rpm to 240 rpm. The center distance between the two sprockets is 750 mm. The driving sprocket has 22 teeth and a PCD of 55 mm. The chain carries a tensile force of 500 N. Determine: i) The number of teeth on the driven sprocket, ii) The pitch of the chain, iii) The length of the chain, iv) The power transmitted if the velocity of the chain is 3 m/s.	15 Marks	L3	CO2
15.	Design a truck spring that has 12 leaves, two of which are full-length leaves, the spring supports are 1 m apart, and the central band is 70 mm wide. The central load is to be 6 KN with a permissible stress of 200 MPa. Determine the thickness, width, and deflection of spring leaves if the total depth to width of the spring is 3. Use $E = 210 \times 1000 \text{ MPa}$.	15 Marks	L3	CO3
Or				
16.	An automotive single plate clutch consists of two pairs of friction surfaces, one between the friction lining and the pressure plate and the other between the friction lining and the flywheel. Eight identical helical compression springs, arranged in parallel, provide the required	15 Marks	L3	CO3

	axial thrust on the friction surface. The total spring force exerted by all springs is 2400 N and the corresponding deflection of each spring is approximately 15 mm. The spring index can be taken as 8. The springs are made of patented and cold-drawn steel wire with an ultimate tensile strength of 1390 N/mm ² and modulus of rigidity of 81370 N/mm ² . The permissible shear stress for the spring wire can be taken as 30% of the ultimate tensile strength. Calculate: (i) wire diameter; (ii) mean coil diameter; (iii) number of active coils; (iv) total number of coils; (v) solid length; (vi) free length; (vii) pitch of the coil; (viii) required stiffness of the spring; and (ix) actual stiffness of the spring.			
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17.	A spur gear with a pitch circle diameter of pinion and gear are 150 mm and 450 mm respectively, transmits 5 KW at 900 rpm of the pinion. The pinion is made up of 40C8 steel, and the gear is made of cast iron. Taking the pressure angle of 20° involute types, design the gear from strength, wear and dynamic load considerations.	15 Marks	L3	C04
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Or

18.	Design a pair of helical gears to transmit 12 KW at 1200 rpm of the pinion. The velocity ratio is 3:1. The pinion has 24 teeth and is made up of 0.2 % carbon steel, untreated. The gear is made up of carbon steel. The teeth are 14.5° involute form in the normal plane. Consider the helix angle is 25 %.	15 Marks	L3	C04
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19.	Design a pair of bevel gears to transmit a power of 25 KW from a shaft rotating at 1200 rpm to a perpendicular shaft to be rotated at 400 rpm. The material used is heat-treated 0.2% carbon steel for both pinion and gear, subjected to heavy shocks for 8- 10 hrs. per day. No of teeth of the pinion is 30.	20 Marks	L3	C05
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Or

20.	A worm gear speed reduction unit is to transmit an input power of 4 KW at a worm speed of 400 rpm. The transmission ratio is 30. The teeth are 20° in the involute form and center distance is 120 mm. Chose the suitable material for the worm and wheel. Also check the heating capacity of the gears and determine whether the design is safe or not?	20 Marks	L3	C05
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