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(Revision-2021)

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, APRIL - 2026

DESIGN OF MACHINE ELEMENTS

[Maximum marks: 75] [Time: 3 Hours]

PART A

I. Answer all the following questions in one word or one sentence. Each question carries 1 mark

(9 x 1 = 9 Marks)

		Module outcome	Cognitive level
1	Define factor of safety.	M1.01	R
2	A short shaft that imparts motion either to a cutting or to a work piece is called ……..	M2.01	R
3	Due to the power transmitted by the shaft, the key may fail due to …….. stresses.	M2.03	U
4	Multiple keys which are made integral with the shaft that fits in the key-ways broached in the hub are called ……..	M2.03	R
5	The angle between the direction of the follower motion and a normal to the pitch curve is called ……..	M3.01	R
6	The ratio of the maximum fluctuation of speed to the mean speed is called ……..	M3.03	R
7	Give any one example for flexible coupling.	M3.05	R
8	The power transmitted by a belt is maximum when the maximum tension in the belt is …….. times centrifugal tension.	M4.02	R
9	When the axes of first and last gear are co-axial, then gear train is known as …….	M4.04	R

PART B

II. Answer any eight questions from the following. Each question carries 3 marks.

(8 x 3 = 24 Marks)

		Module outcome	Cognitive level
1	Explain types of constrained motions.	M1.02	R
2	List the advantages of threaded joints.	M1.03	R
3	List different types of keys.	M2.03	R
4	A steel spindle transmits 47.75 N.m torque. If the angular deflection is not to exceed 0.25° per metre of the spindle, find diameter of spindle. Take G = 84GPa.	M2.02	U
5	A 40 mm diameter shaft is subjected to a tangential force of 20kN around its circumference. Determine the length of key. The allowable shear stress in key is 60 N/mm^2.	M2.03	U
6	Draw the turning moment diagram for a four-stroke cycle internal combustion engine and mark salient points.	M3.03	U

7	Compare fly wheel and governor.	M3.04	U
8	List the classification of bearings.	M3.06	R
9	List the classification of follower.	M3.01	R
10	List three advantages of chain drive over rope drive.	M4.03	R

PART C

Answer all questions. Each question carries seven marks

(6 x 7 = 42 Marks)

		Module outcome	Cognitive level
III	Explain classification of kinematic pairs.	M1.02	U
	OR		
IV	Explain types of riveted joints with neat sketch.	M1.04	U
V	Sketch and explain four bar chain.	M1.02	U
	OR		
VI	A plate 12.5 mm thick is welded to another plate by means of double parallel fillet welds. The plates are subjected to a load of 50 kN. Find the length of the weld so that the maximum stress does not exceed 56 MPa. Consider the joint under static loading and then under fatigue loading. Take stress concentration factor as 2.7.	M1.03	A
VII	A solid shaft is transmitting 1 MW at 240 rpm. Determine the diameter of the shaft if the maximum torque transmitted exceeds the mean torque by 20%. Taking maximum allowable shear stress as 60 Mpa.	M2.02	A
	OR		
VIII	Compare the weight, strength and stiffness of a hollow shaft of the same external diameter as that of solid shaft. The inside diameter of the hollow shaft being half the external diameter. Both the shafts have the same material and length.	M2.02	U
IX	A cam is to give the following motion to a knife-edged follower: 1) Outstroke during 60° of cam rotation. 2) Dwell for the next 30° of cam rotation. 3) Return stroke during next 60° of cam rotation. 4) Dwell for the remaining 210° of cam rotation. The stroke of the follower is 40 mm and minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft.	M3.01	A

	OR		
X	Explain watt governor with a neat sketch.	M3.02	U
XI	A shaft running at 200 rpm is to drive a parallel shaft at 300 rpm. The pulley on the driving shaft is 60 cm. Calculate the diameter of pulley on the driven shaft. i Taking belt thickness into account, which is 5 mm thick ii Assuming a total slip of 4% and belt thickness of 5 mm	M4.02	U
	OR		
XII	Explain spur gear terminology.	M4.04	U
XIII	Two pulleys 600 mm and 400 mm diameters are connected by a belt. Central distance between the pulleys is 6 meters. Find the length of belt required for i Open belt drive and ii Cross belt drive	M4.02	U
	OR		
XIV	A set of spur wheels for gearing of a machine are arranged as follows: A drives B, C drives D and E drives F. Gears B and C and gears D and E are compound wheels. When T_A = 20, T_B = 50, T_C = 25, T_D = 75, T_E = 26 and T_F = 65 teeth and if gear A rotates in clockwise direction at 975 rpm, find the speed and direction of rotation of follower gear F.	M4.04	A

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