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(Revision – 2021)

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Reg. No……
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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 2024

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 '*one*' mark.

(9 x 1 = 9 Marks)

		Module Outcome	Cognitive level
1.	The process of obtaining different mechanism by fixing different links in a kinematic chain is called.....	M1.02	R
2.	The screw is specified by…….diameter	M1.03	R
3.	The shafts are made in standard lengths of..... in SI units	M2.01	R
4.	What is the basic function of a key?	M2.03	R
5.	Define dwell period of a follower	M3.01	R
6.	…….. is used to regulate the mean speed of an engine, when there are variations in the load	M3.04	R
7.	…….. are widely used for operating the inlet and exhaust valves of IC engines.	M3.01	R
8.	Define module of a gear.	M4.04	R
9.	Define train value of gear train.	M4.04	R

PART-B

II. Answer any '*eight*' questions from the following. Each question carries *'three'* marks.

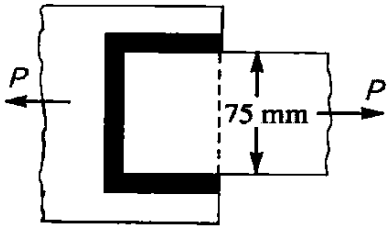
(8 x 3 = 24 Marks)

		Module Outcome	Cognitive level
1.	List six factors governing design of machine element.	M1.01	R
2.	A solid steel shaft is to transmit a torque of 10 kN.m. If the shearing stress is not to exceed 45 MPa, find the minimum diameter of the shaft.	M2.02	U
3.	List the types of keys.	M2.03	R
4.	A solid shaft has to transmit a torque of 30 KN-m. The maximum shear stress is not to exceed 100MPa and angle of twist is not to exceed 1° per meter length. Find the diameter of shaft. Take G=84GPa.	M2.02	U
5.	List the types of shafts.	M2.01	R
6.	Explain coefficient of fluctuation of speed and its significance with respect to flywheel.	M3.03	U
7.	List three functions of bearing.	M3.04	R
8.	List the classification of couplings.	M3.06	R
9.	Draw the displacement diagram when follower moves with Simple harmonic motion.	M3.01	U
10.	List three disadvantages of rope drive over chain drive.	M4.03	R

PART-C

Answer '*all*' questions from the following. Each question carries *'seven'* marks.

(6 x 7 = 42 Marks)

		Module Outcome	Cognitive level
III.	Sketch and explain following weld terms: (i) Leg (ii) Size (iii) Throat thickness	M1.03	U
	OR		
IV.	Explain types of riveted joints with neat sketch.	M1.04	U
V.	Sketch and explain single slider crank chain.	M1.02	U
	OR		
VI.	A plate 75 mm wide and 12.5 mm thick is joined with another plate by a single transverse weld and a double parallel fillet weld as shown in figure. The maximum tensile and shear stress are 70 MPa and 56 Mpa respectively. Find the length of each parallel fillet weld, if joint is subjected to static loading.  	M1.03	A
VII.	A hollow shaft is to transmit 200 kW at 80 rpm. (i) Find the torque transmitted. (ii) If the allowable shear stress is not to exceed 60 MPa and internal diameter is 0.6 of the external diameter, find the diameter of the shaft.	M2.02	A
	OR		
VIII.	A shaft of 50mm diameter is transmitting 150 kW at 3000 rpm. If a key of length 75mm, width 16mm and thickness 10mm is used, calculate induced shear stress and crushing stress in the key.	M2.03	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 the 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 is offset by 20 mm from the axis of the cam shaft.	M3.03	A
	OR		
X.	Explain porter governor with a neat sketch.	M3.02	U

XI.	Two pulleys 800 mm and 400 mm diameters are connected by a belt. Central distance between the pulleys is 5 metres. Find the length of belt required for (a) open belt drive and (b) Cross belt drive.	M4.02	U
	OR		
XII.	Explain spur gear terminology.	M4.04	U
XIII.	An engine shaft running at 120 rpm is required to drive a machine shaft by belt drive. The pulley on the engine shaft is 2 m diameter and that of the machine shaft is 1 m diameter. If the belt thickness is 5 mm, determine the speed of machine shaft. (1) There is no slip (2) There is a total slip of 3%.	M4.02	U
	OR		
XIV.	A set of spur gear wheels are arranged as follows: A drives B, B and C is a compound wheel and C drives D. When T_A= 25, T_B = 50, T_c= 35 and T_D= 70 teeth and gear A rotates at 300 rpm clockwise, find the speed and direction of rotation of follower gear D.	M4.04	A

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