QPC: RJ19BTECH133 AR 19 Reg. No

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fourth Semester – Regular) Examinations, June – 2021

BESAG4060 – Theory of Machines

(Agricultural Engineering)

Time: 2 hrs Maximum: 50 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) **(1 x 10 = 10 Marks)**

Q.1. Answer ***ALL*** questions		[CO#]	[PO#]
a.	Which of the following is a turning pair?	CO1	PO 1
	(i) Piston and cylinder of a reciprocating steam engine	(ii) Shaft with collars at both ends fitted in a circular hole	
	(iii) Ball and socket joint	(iv) Lead screw of a lathe and nut	
b.	Which of the following is a lower pair ?	CO1	PO 1
	(i) ball and socket joint	(ii) piston and cylinder	
	(iii) cam and follower	(iv) both (i) and (ii) above	
c.	In which type of profile of gear, there occurs interference?	CO2	PO 1
	(i) Involute profile	(ii) Cycloidal profile	
	(iii) Both (i) and (ii)	(iv) None of these	
d.	The radial distance of a tooth from the pitch circle to the bottom of the tooth, is called	CO2	PO 1
	(i)Dedundum	(ii) Addendum	
	(iii) Clearance	(iv) Working depth	
e.	A 1.5 kW motor is running at 1440 rpm. It is to be connected to a stirrer running at 36 rpm. The gearing arrangement suitable for this application is	CO2	PO 2
	(i) Differential gear	(ii) Helical gear	
	(iii) Spur gear	(iv) Worm gear	
f.	The centrifugal tension in belts	CO3	PO 1
	(i) reduces power transmission	(ii) increases power transmission	
	(iii) does not affect power transmission	(iv) increases power transmission upto certain speed and then decreases	
g.	Can a simple band brake be made self-energising type	CO3	PO 1
	(i) yes	(ii) yes with lot of sophistication	
	(iii) no	(iv) it may not be economical	
h.	A spring controlled governor will be stable if the controlling force line when produced intersects the Y-axis	CO4	PO 1
	(i) At the origin	(ii) Below the origin	
	(iii) Above the origin	(iv) Any one of these	
i.	If a more stiff spring is used in Hartnell governor, then the governor will be _____.	CO4	PO 1
	(i) more sensitive	(ii) less sensitive	
	(iii) sensitively remains unaffected	(iv) isochronous	
j.	In order to facilitate the starting of locomotive in any position, the cranks of a locomotive, with two cylinders, are placed at _____ to each other.	CO4	PO 1
	(i) 45°	(ii) 90°	
	(iii) 120°	(v) 180°	

PART – B: (Short Answer Questions) (2 x 5 = 10 Marks)

Q.2. Answer ***ALL*** questions	[CO#]	[PO#]
a. State the inversions of double slider crank chain.	CO1	PO 1
b. Differentiate between involute tooth profile and cycloidal tooth profile.	CO2	PO 1
c. Why does a single cylinder engine need large flywheel?	CO2	PO 1
d. What are the advantages of wire ropes?	CO3	PO 1
e. What are the conditions for complete balancing of a system?	CO4	PO 1

PART – C: (Long Answer Questions) (6 x 5 = 30 Marks)

Answer ***ANY FIVE*** questions	Marks	[CO#]	[PO#]
3. A crank and slotted lever mechanism used in a shaper has a centre distance of 30 mm between the centre of oscillation of the lever and the centre of rotation of the crank. (Refer Fig.1) If the radius of the crank is 120 mm, find the ratio of the time of cutting to the time of return stroke.	(6)	CO1	PO 2

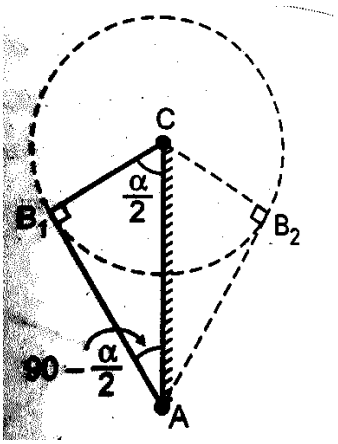

Fig.1

4. What do you understand by kinematic inversion? Explain three different inversions of slider crank mechanism.	(6)	CO1	PO 1
5. An epicyclic gear train consists of three gears A,B and C as shown in Fig.2. The number of teeth on annular gear A is 74 and on gear C is 34. The gear B meshes with both gear A and C and it is carried on an arm F which rotates about the centre A at 25 rpm. If the gear a is fixed, find the speeds of gears B and C.	(6)	CO2	PO 2

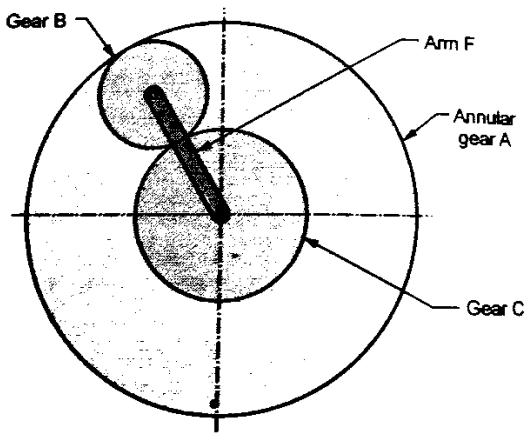

Fig.2

6.	The radius of gyration of a flywheel is 1 m and the fluctuation of speed is not to exceed 1 % of the mean speed of the flywheel. If the mass of the flywheel is 3340 kg and the steam engine develops 150 kW at 135 rpm, find: i) Maximum fluctuation of energy ii) Coefficient of fluctuation of energy	(6)	CO2	PO 2
7.	For a flat belt drive, derive the expression for ratio of belt tensions on tight and slack sides (T_1 and T_2) in terms of the angle of contact (θ) and the coefficient of friction (μ) $$\frac{T_1}{T_2} = e^{\mu\theta}$$	(6)	CO3	PO 2
8.	The maximum allowable tension in a v-belt of groove angle of 45°, is 1500 N. the angle of lap is 170° and the coefficient of friction between the belt and material of the pulley is 0.27. if the belt is running at 2 m/s, determine i) Net driving tension and ii) Power transmitted by the pulley. Neglect effect of centrifugal tension.	(6)	CO3	PO 2
9.	A shaft is rotating at a uniform angular speed. Four masses m1,m2,m3 and m4 of magnitudes 300 kg, 450 kg, 360 kg and 390 kg respectively are attached to the shaft. The masses are rotating in the same plane. The corresponding radii of rotation are 200 mm, 150 mm, 250 mm and 300 mm respectively. The angles made by these planes with the horizontal are 0°, 45°, 120° and 255° respectively. Find graphically or otherwise i) The magnitude of the balancing mass ii) The position of the balancing mass if its radius of rotation is 200 mm.	(6)	CO4	PO 2
10.	Derive an expression for the height of Watt governor and prove that the height of the governor is inversely proportional to the square of the speed of governor.	(6)	CO4	PO 1

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