University Institute of Engineering & Technology

(Recognised Under Section 2(f) and 12B of UGC)

Kurukshetra University, Kurukshetra

THEORY EXAMINATION – FEB 2021	
B.TECH – Mechanical Engineering	**SEMESTER – III**

TIME – 3 Hrs. 15 Min

M.M. - 56

PAPER - MEC-201

SUBJECT- Theory of Machines

INSTRUCTIONS TO BE FOLLOWED

- **Allotted time for examination is 3 hours 15 minutes that includes time for downloading the question paper, writing answers, scanning of answer sheets and E-mailing the PDF files to the designated Email ID.**
- **For all B Tech. Mechanical Engineering Students, the Email ID is:- btechmechuiet@kuk.ac.in**
- **The candidates will be required to attempt 75% of the question paper (maximum) by choosing to their any best questions accumulating 56 marks.**
- **The PDF files should be saved as Roll No. and Subject Code. Proper attention should be given while sending the email and in the subject line, the Roll Number and Subject Code should be mentioned.**
- **Maximum Page Limit should be 20 (Twenty) for attempting the question paper on A4 sheets which could be downloaded and printed from the sample sheets given in the Kurukshetra University Examination guidelines.**
- **Over-attemptation should be avoided.**
- **Handwriting should be neat and clean and diagrams should be clear and contrasted.**
- **The candidate should not write their Mobile No. otherwise Unfair Means Case will be made.**
- **While attempting the paper, the candidate will use blue/black pen only.**
- **Before attempting the paper, the candidate will ensure that he/she has downloaded the correct question paper. No complaint for attempting wrong question paper by the candidate will be entertained.**
- **Candidate must ensure that he/she has put his/her signature on each page of the answer sheet used by him/her. Answer sheet without the signature of the candidate will not be evaluated.**

PART-A (15 Marks)

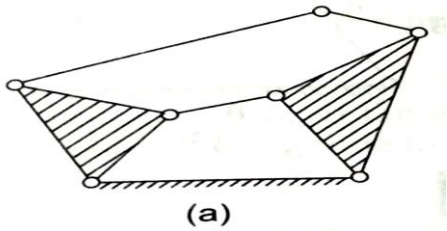
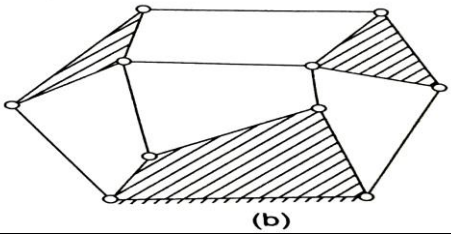
Q. No. – 1 Answer the following questions. 15x1=15

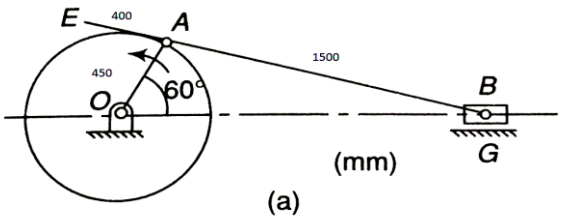
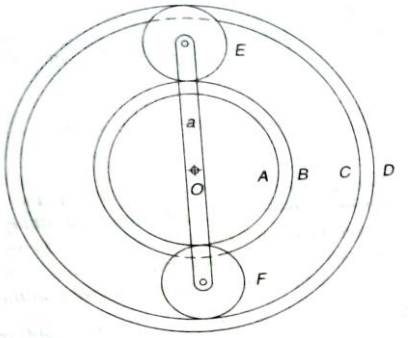
(i)	Discuss the mobility of mechanisms.
(ii)	Explain the main conditions for rocker-rocker mechanism.
(iii)	Describe the vector addition and subtraction rules.
(iv)	Discuss the rules to locate I-centres by inspection.
(v)	Recognise the Tangential and centripetal component of acceleration.
(vi)	Explain the pitch curve and pressure angle in cam profile.
(vii)	Explain the condition of static equilibrium when three force act upon a body.
(viii)	Define the D'Alembert's principle.
(ix)	Explain the turning moment due to force f on the piston.
(x)	Describe the turning moment diagrams. Why they are drawn?
(xi)	Identify the term of crowning in case of flat belt.
(xii)	Describe the following terms. (a) Intermediate pulley (b) loose and fast pulley
(xiii)	What is the difference between double-helical and herringbone gears?
(xiv)	Identify the velocity ratio for reverted gear train.
(xv)	Explain the circular pitch of spur gear.

PART-B (20 Marks)

2	Solve the Grashof 's law conditions also develop the crank-crank and crank-lever mechanism practical applications.	**5**
3	Explain the cam and its types.	**5**
4	Develop the conditions of balancing when several masses rotating in different planes.	**5**
5	Develop the Involute teeth profile and calculate the effect of altering the centre distance on the velocity ratio for involute teeth gears.	**5**

PART-C (40 Marks)

6	Determine the degree of freedom for given kinematic linkage as shown in fig (a) &(b).  (a)  (b)	**10**
7	Explain Kennedy's theorem and create all I- centre (instantaneous centre) for four bar link mechanism.	**10**
8	For the configuration of a slider-crank mechanism shown in fig. calculate the	**10**

	 (a) (1) Acceleration of the slider at B. (2) Acceleration of the point E. **(3)** Angular acceleration of the link AB, OA rotates at 30 rad/s counter-clockwise.	
9	A cam with minimum radius of 30mm is to be designed for knife-edge follower with following data:- (a) To rise the follower through 40 mm during 120 degree rotation of the cam. (b) dwell for next 30 degree of cam rotation. (c) descending of the follower during 90 degree of cam rotation. (d) dwell during the rest of the cam rotation. Draw cam profile of cam if ascending of cam is with simple harmonic motion and descending of cam with constant velocity and the line of stroke of follower is offset 10 mm from the axis of cam rotation.	**10**
10	Express the relation for velocity and acceleration of a piston. Also determine the relation for angular velocity and angular acceleration of connecting rod.	**10**
11	Three masses of 10 kg, 15 kg and 20 kg attached at radial distance of 70 mm, 120 mm and 50 mm respectively to a disc on shaft are in complete balance. Determine the angular positions of the masses of 15 kg and 20 kg relative to 10 kg masses.	**10**
12	Develop the relation for path of contact and arc of contact in tooth gears.	**10**
13	In the epicyclic gear train shown in fig, the compound wheel A and B as well as internal Wheel C and D rotates independently about the axis O. the wheel E and F rotates on the Pins fixed to arm a. all the wheel are of the same module. The number of teeth on wheel are T_A= 60, T_B= 70, T_E=T_F= 30. Determine the speed of C if (1) The wheel D fixed and arm a rotates at 300 rpm clockwise. (2) The wheel D rotates at 300 rpm counter clockwise and the arm a rotates at 20 rpm Counter clockwise. 	**10**