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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

Programme:	**B.tech Mechanical**	**Semester – IV**	
Course Name:	**Theory of Machine**	**Max. Marks**	**: 100**
Course Code:	**GNEG-231**	**Duration**	**: 3 Hrs**
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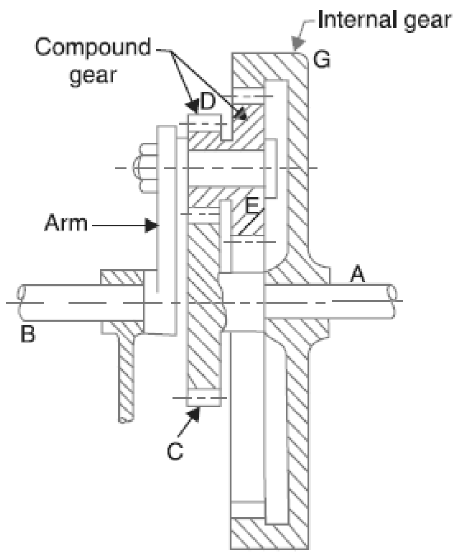
Section A

Q.1	Explain three types of constrained motions. Illustrate your answer using neat sketches	**[10]**	**CO1**
Q.2	In a crank and slotted lever quick return mechanism, the distance between the fixed centers is 150 mm and the driving crank is 75 mm long. Determine the ratio of the time taken on the cutting and return strokes.	**[5]**	**CO1**
Q.3	A spur gear has 30 teeth and module of 1.4 mm. it rotates at 360 rpm .Determine its circular pitch and pitch line velocity.	**[5]**	**CO3**

Section B

Q.4	Two shafts A and B are co-axial. A gear C (50 teeth) is rigidly mounted on shaft A. A compound gear D-E gears with C and an internal gear G. D has 20 teeth and gears with C and E has 35 teeth and gears with an internal gear G. The gear G is fixed and is concentric with the shaft axis. The compound gear D-E is mounted on a pin which projects from an arm keyed to the shaft B. Sketch the arrangement and find the number of teeth on internal gear G assuming that all gears have the same module. If the shaft A rotates at 110 r.p.m Find the speed of shaft B.	**[15]**	**CO3**



Q.5 A shaft is rotating at uniform angular speed. Four masses are attached to the shaft. The masses are rotating in the same plane. The corresponding radii of rotation are mention in Table 1 **CO4** **[15]**

Masses	Kg	Radius of rotation (mm)	Angles of masses with horizontal(degrees)
M1	300	200	0
M2	450	150	45
M3	360	250	120
M4	390	300	255

Find 1. **Magnitude of balancing of mass**
2. **Position of balancing mass if radius of rotation is 200 mm.**

Q.6 Explain the following characteristics of governors: **CO5** **[10]**
(i) Isochronism (ii) Sensitiveness (iii) Hunting (iv) stability

Section C

Q.7 **Following entities pertains to Porter governor** **CO5** **[20]**

Length of upper arms	=	200 mm
Length of lower arms	=	225 mm
Upper arms hinged at a distance from axis of rotation	=	30 mm
Lower arms pivoted at a distance from axis of rotation	=	40mm
Mass of each governor ball is	=	3kg
Central load on sleeve	=	28 kg
Force of friction on the sleeve	=	25 N
Masses revolve at a radius	=	150mm @ min.speed
Masses revolve at a radius	=	170mm @ max..speed

Determine Range of speed for the given conditions.

Q.8 Draw the profile of the cam when the roller follower moves with following motions as given below: **CO2** **[20]**
(a) Outstroke with Simple Harmonic Motion, maximum displacement of 44 mm during 120° of cam rotation.
(b) Dwell for the next 30° of cam rotation.
(c) Return stroke, Uniform Acceleration and retardation for 150° of cam rotation.
The minimum radius of the cam is 20 mm and the diameter of the roller is 15 mm. The axis of the roller follower passes through the cam shaft axis.

Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 r.p.m Also draw the graph for velocity and acceleration of follower with reference to cam rotation.

OR

Q.9 Draw the profile of the cam when the roller follower moves with Simple Harmonic motion as given below: **CO2** **[20]**

(a) Outstroke with maximum displacement of 50 mm during 180° of cam rotation it follows

(b) Dwell for the next 30° of cam rotation.

(c) Return stroke for the next 150° of cam rotation.

(d) The minimum radius of the cam is 20 mm and the diameter of the roller is 15 mm. The axis of the roller follower is offset 15 mm from the cam shaft axis.

Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 r.p.m Also draw the graph for velocity and acceleration of follower with reference to cam rotation.