UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2018

Program: B Tech Mechatronics **Semester: IV**
Course: Theory of Machines **Course Code GNEG 231**
Time: 03 hrs. **Max. Marks: 100**
Instructions:

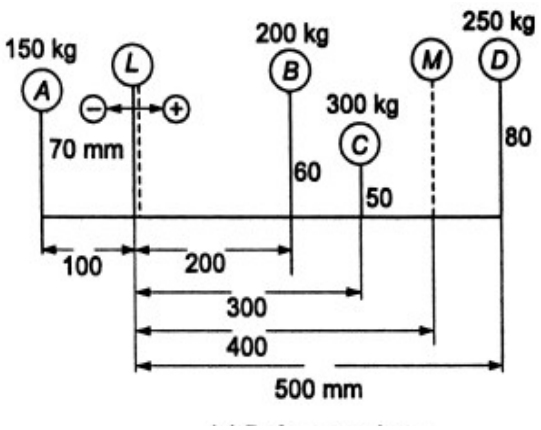
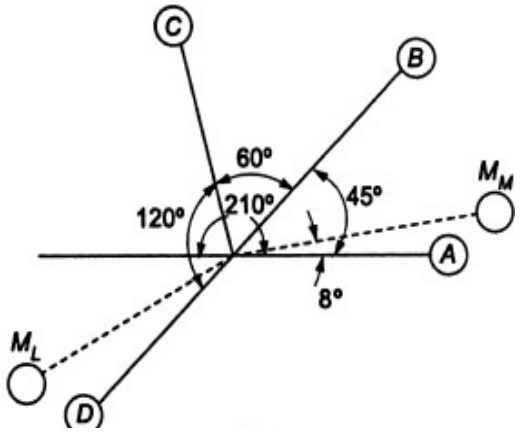
SECTION A

S. No.	Statement of question	Marks	CO
Q 1	State and explain types of constrained motion.	**5**	**CO1**
Q 2	What is velocity of rubbing? How is it found?	**5**	**CO1**
Q 3	What is a cam? What type of motion can be transmitted with a cam and follower combination?	**5**	**CO3**
Q 4	Does a rotor which is statically balanced requires dynamic balancing?	**5**	**CO4**

SECTION B

Q 5	Describe the procedure to draw velocity and acceleration diagrams of a four-link mechanism. In what way the angular accelerations of the output link and the coupler are found?	**10**	**CO1**
Q 6	A cam is to operate a flat faced follower having uniform acceleration and deceleration during ascent and descent. The least radius of the cam is 50 mm. During descent, the deceleration period is half of the acceleration period. The ascent lift is 37.5 mm. The ascent is for 1/4th period, dwell for 1/4th, descent for 1/3rd, and dwell for the remaining 1/6th period. Draw the cam profile. OR A cam is to operate an offset roller follower. The least radius of the cam is 50 mm, roller diameter is 30 mm, and offset is 20 mm. The cam is to rotate at 360 rpm. The angle of ascent is 48°, angle of dwell is 42°, and angle of descent is 60°. The motion is to be SHM during ascent and uniform acceleration and deceleration during descent. Draw the cam profile.	**15**	**CO3**
Q 7	The arms of a Porter governor are each 200 mm long. The weight of each ball is 40 N and that of the sleeve is 200 N. The radius of rotation of the balls is 125 mm when the sleeve begins to rise and reaches a value of 150 mm for maximum speed. Determine the speed range of the governor. If the friction at the sleeve is equivalent to 20 N of load at the sleeve, determine how the speed range is modified.	**15**	**CO5**

SECTION-C

Q 8	In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find: The speed and direction of gear C when gear B is fixed and the arm A makes 100 rpm clockwise.	**20**	**CO2**
Q 9	A shaft carries four masses as shown in Fig. below. The balancing masses are to be placed in planes *L* and *M*. If the balancing masses revolve at a radius of 100 mm, find their magnitude and *angular positions.*   OR An inside cylinder locomotive has its cylinder centre lines 0.8 m apart and has a stroke of 0.6 m. The rotating masses are equivalent to 150 kg at the crank pin and the reciprocating masses per cylinder are 300 kg. The wheel centre lines are 1.8 m apart. The cranks are at right angles. The whole of the rotating and 2/3rd of the reciprocating masses are to be balanced by masses placed at a radius of 0.5 m. Find (a) the magnitude and direction of the balancing masses, (b) the fluctuation in rail pressure under one wheel, (c) the variation of tractive effort and (d) the magnitude of swaying couple at a crank speed of 300 rpm.	**20**	**CO4**