BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BE **SEMESTER: VI/ADD**
BRANCH: MECH **SESSION: SP/2020**

SUBJECT: ME6005 DYNAMICS OF MACHINES

TIME: 1.5 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.
6. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q1 (a) Differentiate between static and dynamic balancing. [2]

(b) Four masses A, B, C and D carried by a rotating shaft at radii 80 mm, 100 mm, 160 mm and 120 mm respectively are completely balanced. Masses B, C and D are 8 kg, 4 kg and 3 kg respectively. Determine the mass A and the relative angular positions of the four masses if the planes are spaced 500 mm apart. [3]

Q2 (a) The cranks of a three-cylinder locomotive are set at 120°. The reciprocating masses are 450 kg for the inside cylinder and 390 kg for each outside cylinder. The pitch of the cylinders is 1.2 m and the stroke of each piston is 500 mm. The planes of rotation of the balance masses are 960 mm from the inside cylinder. If 40% of the reciprocating masses are to be balanced, determine the magnitude and the position of the balancing masses required at a radial distance of 500 mm, and the hammer-blow per wheel when the axle rotates at 350 rpm. [5]

Q3 (a) What are inline engines? [2]

(b) The axes of a three-cylinder air compressor are at 120° to one another and their connecting rods are coupled to a single crank. The length of each connecting rod is 240 mm and the stroke is 160 mm. The reciprocating parts have a mass of 2.5 kg per cylinder. Determine the primary and secondary forces if the engine runs at 4000 rpm. [3]

Q4 (a) The cylinders of a V-engine are set at an angle of 40° with both cylinders connected to a common crank. The connecting rod is 300 mm long and the crank radius is 60 mm. The reciprocating mass is 1 kg per cylinder whereas the rotating mass at the crank pin is 1.5 kg. A balance mass equivalent to 1.8 kg is also fitted opposite to the crank at a radius of 80 mm. Determine the maximum and the minimum values of the primary and secondary forces due to inertia of the reciprocating and rotating masses if the engine rotates at 1000 rpm. [5]

Q5 (a) Explain the terms hunting and stability relating to governors. [2]

(b) Describe the function of a Porter governor with the help of a neat sketch. Establish a relation among various forces acting on the bent link. [3]

Q6 (a) In a Porter governor, each of the four arms is 400 mm long. The upper arms are pivoted on the axis of the sleeve whereas the lower arms are attached to the sleeve at a distance of 45 mm from the axis of rotation. Each ball has a mass of 8 kg and the load on the sleeve is 60 kg. What will be the equilibrium speeds for the two extreme radii of 250 mm and 300 mm of rotation of the governor balls? Also, find the sensitiveness. [5]

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