PAPER ID-420883

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM VI) THEORY EXAMINATION 2021-22
DYNAMICS OF MACHINE

Time: 3 Hours ***Total Marks: 100***

Notes: 1. Attempt all sections. if require any missing data; then choose suitably
.

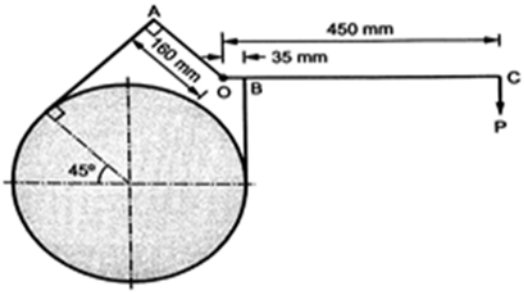
SECTION A

1. Attempt *All*.

a.	Draw the turning moment diagram for a four-stroke I. C. engine.
b.	Define the coefficient of fluctuation of speed.
c.	What is the difference between free and forced vibration?
d.	What do you mean by Gyroscope?
e.	What is hammer blow?
f.	What is the primary unbalanced and secondary unbalance force of reciprocating parts?
g.	What is the difference between governor and flywheel?
h.	What is meant by the effort and power of the governor? Show the expressions for the same in a porter governor.
i.	What is meant by self-locking and self-energizing brake?
j.	Distinguish between brakes and dynamometers?

SECTION B

2. Attempt any *03 parts* of the following:

a.	Deduce the expression for the inertia force in the reciprocating engine neglecting the weight of the connecting rod.
b.	Discuss any one case of gyroscopic effect on I. The stability of a four-wheeler while negotiating a curve. II. A two-wheeler tilt on one side.
c.	Explain the method of balancing different masses revolving in the same plane
d.	Describe a Hartnell-type governor with the help of a neat sketch. Derive an expression for equilibrium speed
e.	**Figure 1** shows differential band brakes which sustain a torque of 400 N-m. The diameter of the drum is 0.5m and the coefficient of friction is 0.35 Find: (i) applied force P for clockwise and anticlockwise rotation of the drum. (ii) The distance OA for the self-locking of the brake when the drum rotates clockwise  **Figure 1**

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM VI) THEORY EXAMINATION 2021-22
DYNAMICS OF MACHINE

SECTION C

3. Attempt any *01* part of the following:

(a)	The turning moment diagram curve for an engine is represented by the equation T= (20000 + 9500 sin2θ - 5700 cos2θ) Nm where θ is the angle turned by the crank from IDC. If the resisting torque is constant, find i) power developed by the engine. ii) Moment of inertia of flywheel in kg-m^2 If the total fluctuation of speed is not to exceed 1 % of mean speed, which is 180 r.p.m (iii) Angular acceleration of flywheel when the crank has turned through 45^o from IDC
(b)	Determine the required input torque on the crank of the slider-crank mechanism for the static equilibrium when the applied piston load is 1500 N. The lengths of the crank and the connecting rod are 40 mm and 100mm respectively and the crank has turned through 45o from the IDC.

4. Attempt any *01* part of the following:

(a)	Explain in what way gyroscopic couple affects the motion of an aircraft while taking a turn? The turbine rotor of a ship has a mass of 2.2 tonnes and rotates at 1800 r.p.m. clockwise when viewed from the left. The radius of gyration of the rotor is 320 mm. determine the gyroscopic couple and its effect when the: (i) Ship turns right at a radius of 250 m with a speed of 25 km/hr (ii) Ship pitches with the bow rising at an angular velocity of 0.8 rad/s. (iii) Ship rolls at an angular velocity of 0.1 rad/s.
(b)	Deduce the expression for the free longitudinal vibration in terms of spring stiffness, its inertia effect and suspended mass.

5. Attempt any *01* part of the following:

(a)	Three masses of 8 kg, 12 kg, and 15 kg attached at a radial distance of 80 mm, 100 mm, and 60 mm respectively to a disc on a shaft are in complete balance. Determine the angular position of the masses 12 kg and 15 kg relative to 8 kg mass
(b)	A shaft is supported in bearings 1.6 m apart and projects 0.4 m beyond bearings at each end. The shaft carries three pulleys one at each end and one at the middle of its length. The mass of end pulleys is 40 kg and 22 kg and their center of gravity are 12 mm and 18 mm respectively from the shaft axis. The center pulley has a mass of 38 kg and its centre of gravity is 15 mm from the shaft axis. If the pulleys are arranged so as to give static balance, determine: (i) Relative angular positions of the pulleys, and (ii) Dynamic forces produced on the bearings when the shaft rotates at 210 r.p.m.

6. Attempt any *01* part of the following:

(a)	In a Proell governor, the mass of each ball is 8 kg and the mass of the sleeve is 120 kg. Each arm is 180 mm long. The length of extension of the lower arm to which the balls are attached is 80 mm. The distance of pivots of arms from the axis of rotation is 30 mm and the radius of rotation of the balls is 160 mm when the arms are inclined at 40° to the axis of rotation. Determine the: (i) Equilibrium speed (ii) Coefficient of insensitiveness if the friction of the mechanism is equivalent to 30 N. (iii)Range of speed when the governor is inoperative
(b)	Define the following Characteristics of a governor: a) Sensitivity b) Stability c) Isochronism d) Hunting e) Effort f) Power

7. Attempt any *01* part of the following:

(a)	Explain the working principle of the internal expanding shoe brake. Derive the relation for friction torque for such a brake.
(b)	A simple band brake as shown in figure-1 is applied to a shaft carrying a flywheel of 250 kg mass and of a radius of gyration of 300 mm. The shaft speed is 200 r.p.m. The drum diameter is 200 mm and the coefficient of friction is 0.25. Determine the: (i) Brake torque when a force of 120 N is applied at the lever end. (ii) Number of turns of the flywheel before it comes to rest. (iii) Time taken by the flywheel to come to rest