R16

Code No: 134AU

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, April - 2018
DYNAMICS OF MACHINERY
(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a)	Write the expression for gyroscopic couple.	[2]
b)	What is the effect of gyroscopic couple on rolling of ship?	[3]
c)	Explain the term maximum fluctuation of energy in flywheel.	[2]
d)	Why flywheels are needed in forging and pressing operations?	[3]
e)	What is difference between co-efficient of friction and angle of friction?	[2]
f)	What are the different types of mechanical brakes?	[3]
g)	What is the function of Governor?	[2]
h)	What is meant by sensitiveness of a governor?	[3]
i)	What are the various types of damping?	[2]
j)	When do you say a vibration system is under-damped?	[3]

PART-B

(50 Marks)

2. In a four link mechanism ABCD, the link AB revolves with an angular velocity of 10 radians/second and angular acceleration of 20 radians/sec^2. The instant when it makes an angle of 45^0 with AD the fixed link. The lengths of the links are AB=CD=800 mm, BC=1000 mm and AD=1500 mm. The mass of the links is 4kg/m length. Determine the torque required to overcome the inertia forces, neglecting the gravitational effects. Assume the links to be of uniform cross-section. [10]

OR

3. A racing car weighs 20kN.It has a wheel base of 2m, track width of 1m and height of C.G 300mm above ground level and lies midway between the front and rear axles. The engine flywheel rotates at 3000 rpm clockwise when viewed from the front. The moment of inertia of the flywheel is 4kgm^2 and the moment of inertia of each wheel is 3kgm^2. Find the reactions between the wheels and the ground when the car takes a curve of 15m towards right at 30 km/hr, taking into consideration the gyroscopic and centrifugal effects. Each wheel radius is 400mm. [10]

4. Draw the turning moment diagrams for the following engines neglecting the effect of inertia of the connecting rod:
   a) Four stroke I.C. Engine
   b) Multi-cylinder engine. [5+5]

OR

5. The torque extorted on the crank shaft of a two stroke engine is given by $T=15000+2000\sin 2\theta-1800\cos 2\theta$ N-m. Assuming the resistance torque to be constant, determine:
a) The power of the engine when running at 150 r.p.m
b) The moment of inertia of flywheel if the speed variation from the mean speed of 150 r.p.m is not to exceed ± 0.5%.
c) The angular acceleration of flywheel for $\theta = 30^0$. [3+4+3]

6.a) Describe a single plate clutch with a neat diagram.
b) State the laws of static and dynamic friction. [5+5]

OR

7.a) Explain a torsion dynamometer with a neat sketch.
b) The following data refer to a rope brake dynamometer in a Laboratory experiment.
Diameter of the flywheel=1m
Diameter of the rope=10 mm.
Dead weight on the brake=50 kg
Speed of the engine =180 rpm
Spring balance reading=120 N.
Find the power of the engine. [5+5]

8.a) Derive an expression for the determination of equilibrium speed of a Porter governor.
b) Calculate the minimum speed of a Porter governor, which has equal arms each 200 mm long and are pivoted on the axis of rotation. The mass of each ball is 5 kg and the minimum radius of rotation for the ball is 100 mm. [5+5]

OR

9.a) What is primary and secondary balancing in reciprocating engines?
b) The cranks of a three cylinder locomotive are set at 120^0.The stroke is 120 mm, the length of the connecting rod is 240 mm, the mass of the reciprocating parts per cylinder is 1 kg and the speed of the crank shaft is2400 rpm. Determine the magnitude of primary and secondary balancing. [5+5]

10.a) Describe Dunkerley's method to find the natural frequency of a shaft carrying several loads.
b) A shaft 50 mm diameter and 3 m long is simply supported at its ends and carries three loads of 1000 N, 1500N and 750N at 1m, 2m and 2.5m from the left support. Modulus of elasticity is 200 GN/m^2 Find the frequency of transverse vibrations. [5+5]

OR

11.a) Establish an expression for the amplitude of forced vibration.
b) A body of mass 20kg is suspended from a spring which deflects 15mm under this load. Calculate the frequency of free vibrations and verify that a viscous damping force of 1000N at a speed of 1 m/s is just sufficient to make the motion a periodic. [5+5]

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