INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MECHANICAL ENGINEERING

ASSIGNMENT QUESTIONS

Course Name	:	**DYNAMICS OF MACHINERY**
Course Code	:	A50317
Class	:	III-I Semester
Branch	:	Mechanical Engineering
Year	:	2017 – 2018
Course Faculty	:	Prof .V. V. S. H. Prasad, Professor, Ms D. Krishnaja, Assistant Professor

OBJECTIVES:

I. To provide the students knowledge in determining the various forces acting on different components and analyse them for safe design.

II. Students will be able to understand governors, dynamometers, brakes, clutches and flywheels and their application in industries.

III. Able to understand the concept of vibrations and balancing.

IV. To develop and learn the concepts of gyroscopic couples and friction.

V. The subject influences the students in doing research.

ASSIGNMENT-I			
S No.	**Question**	**Blooms Taxonomy Level**	**Course Outcomes**
1	The mass of turbine rotor of a ship is 8 tonnes and has a radius of gyration of 0.6 meters. It rotates at 1800 rpm clockwise when looking from the front. Determine the gyroscopic effect if The ship is travelling at 100 km/h and steers to the right in a curve of 70 meters radius.The ship is pitching and the bow descends with maximum velocity. The pitching is simple harmonic and the total angular movement between the extreme positions is 10 degrees.The ship is rolling and at a certain instant has an angular velocity of 0.03 radians/ second clockwise when looking from bow.	Concept Application	1
2	Determine the required input torque on the crank of a slider crank mechanism for static equilibrium when the applied piston load is 1500N. The length of the crank and connecting rod are 40 mm and 100 mm respectively and the crank has turned through 45^0 from the inner dead center.	Concept Application	1
3	The mean diameter of Whitworth bolt having V-Threads is 25 mm. The pitch of the thread is 5 mm and the angle of V is 55^0. The bolt is tightened by a nut whose mean radius of bearing surface is 25 mm. If the coefficient of friction between nut and bolt is 0.1 and nut with bearing surface is 0.16, find the force required at the end of the spanner 0.5 m long when the load on the bolt is10kN	Application, Comprehension	1
4	A band brake acts on 3/4 th of a circumference of a brake drum of 450	Application	1

<table>
<tr><td></td><td>mm diameter which is keyed to a shaft. The band brake provides a braking torque of 225 Nm. One end of the lever is attached to a fulcrum pin of the lever and the other end is attached to a pin 100 mm from the fulcrum. If the operating force is applied at 500 mm from the fulcrum and coefficient of friction is 0.25, find the operating force when the drum rotates in
i. Clock-wise direction
ii. Anti- clockwise direction.</td><td>Comprehension</td><td></td></tr>
<tr><td>5</td><td>Name different types of dynamometers and explain any one of them.</td><td>Application
Comprehension</td><td>1</td></tr>
<tr><td colspan="4">ASSIGNMENT-II</td></tr>
<tr><td>1</td><td>The effective turning moment exerted by a two stroke engine at crank shaft is T= 8000+ 1000sin2θ- 2000cos2θ where θ is the inclination of the crank to inner dead center. The mass of the flywheel is 500kg and radius of gyration is 750 mm. The engine speed is 300 rpm. Determine the power developed, the total percentage fluctuation of speed and maximum angular retardation</td><td>Application,
Comprehension</td><td>3, 4</td></tr>
<tr><td>2</td><td>Each arm of a porter governor is 300 mm long and is pivoted on the axis of rotation. Each ball has a mass of 6 kg and the sleeve weighs 18kg. The radius of rotation of the ball is 200 mm when the governor begins to lift and 250 mm when the speed is maximum. Determine the maximum and minimum speeds and the range of speed of the governor.</td><td>Knowledge,
Comprehension</td><td>3, 4</td></tr>
<tr><td>3</td><td>A rotor has the following properties:
<table><tr><th>Mass</th><th>Magnitude</th><th>Radius</th><th>Angle</th><th>Axial distance from first mass</th></tr><tr><td>A</td><td>9kg</td><td>100mm</td><td>0^0</td><td>-</td></tr><tr><td>B</td><td>7kg</td><td>120mm</td><td>60^0</td><td>160 mm</td></tr><tr><td>C</td><td>8kg</td><td>140mm</td><td>135^0</td><td>325 mm</td></tr><tr><td>D</td><td>6kg</td><td>120mm</td><td>270^0</td><td>560mm</td></tr></table>If the shaft is balanced by two counter masses located at 100 mm radius and revolving in planes midway of planes A and B, and midway of planes C and D, determine the magnitude of the masses and their corresponding angular positions.</td><td>Application
Comprehension</td><td>3, 4</td></tr>
<tr><td>4</td><td>A cantilever shaft of 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free end. The Young's modulus of the shaft material is 200 GN / m^2. Determine the frequency of longitudinal and transverse vibrations of the shaft.</td><td>Comprehension</td><td>3, 4</td></tr>
<tr><td>5</td><td>Explain a three rotor vibratory system and find the ratio of their amplitudes</td><td>Analysis</td><td>3, 4</td></tr>
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Prepared by: D.Krishnaja, Assistant Professor

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