Code No: 115DY **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech III Year I Semester Examinations, November - 2015
DYNAMICS OF MACHINERY
(Common to ME, MCT, AME, MSNT)

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.

Illustrate your answers with NEAT sketches wherever necessary.

PART- A (25 Marks)

1.a) Distinguish between the applied torque in gyroscopic motion. [2]
b) What do you mean by 'Equivalent Inertia force'? Explain briefly. [3]
c) What is the difference between a brake and clutch. [2]
d) Do you recommend the uniform pressure theory or uniform wear theory to find the friction torque of a bearing. Justify your answer. [3]
e) What is the difference between the *Porter* and *Proell* governors. [2]
f) When and why is the correction couple applied while considering the inertia of the connecting rod of a reciprocating engine? [3]
g) Distinguish between static balancing and dynamic balancing. [2]
h) In a six – cylinder four – stroke engine, state which of the following are balanced: Primary forces, Primary couples, Secondary forces, and Secondary couples, [3]
i) Explain what is meant by 'torsionally equivalent shaft'? [2]
j) Define the terms: Damping coefficient, critical damping coefficient, and damping factor. [3]

PART-B (50 Marks)

2. How do the effects of gyroscopic couple and of the centrifugal force make the rider of a two – wheeler to tilt on one side? Derive a relation for the limiting speed of the vehicle. [10]

OR

3. The length of connecting rod of a gas engine is 500 mm, and its C.G. lies at 165 mm from the crank pin center. The rod has a mass of 80 kg and a radius of gyration of 180 mm about an axis passing through the centre of the mass. The stroke of piston is 225 mm, and the crank speed is 300 rpm. Determine the inertia force on the crankshaft when the crank has turned through 125^0 from the inner dead centre. [10]

4. A turnbuckle is used to tighten a wire rope. The threads are right – hand and left – hand on the turnbuckle, and are square in section. The pitch is 6 cm, and the mean diameter of the screw is 2 cm. Assuming the coefficient of friction between the screw and nut is 0.15, determine the turning moment necessary (a) to tighten the wire, (b) to slacken the wire. The wire rope is assumed not to twist. [10]

OR

5. Show that the torque transmitted by a cone clutch is given by: $T=\frac{2\mu W(R^3-r^3)}{3\sin\alpha(R^2-r^2)}$ with usual notations for the symbols in the formula cited. [10]

6. In a turning moment diagram, the areas above and below the mean torque line, taken in order, are 5.81, 3.23, 3.87, 5.16, 1.94, 3.87, 2.58, and 1.94 cm^2 respectively. The scales of the diagram are : Turning moment $\Rightarrow$ 1 cm = 7 kN-m ; Crank angle $\Rightarrow$ 1 cm = 60^0. The mean speed of the engine is 120 rpm, and the variation of speed must not exceed ± 3 % of the mean speed. Assuming the radius of gyration of the flywheel to be 106.67 cm, find the weight of the flywheel to keep the speed within the given limits. [10]

OR

7. Deduce the governing equation of a Porter governor, taking into account the friction at the sleeve. Also discuss the effect of friction on the functioning of the governor. [10]

8. A number of masses are attached to a shaft which is rotating at an angular speed of ω rad/s. If the masses are in different planes, describe the method of balancing all theses masses (either analytically or graphically). [10]

OR

9. A single – cylinder reciprocating engine has the following data : Speed of the engine = 240 rpm ; Stroke = 320 mm ; Mass of the reciprocating parts = 70 kg ; Mass of the revolving parts = 52.5 kg at the crank radius.; If 65 % of the reciprocating parts and all the revolving parts are to be balanced, find the (a) balancing mass required at a radius of 300 mm, and (b) unbalanced force when the crank has revolved through 60^0 from T.D.C. [5+5]

10.a) Find the natural frequency of transverse vibrations of a system, having several point loads attached to the same shaft, by Dunkerley's method.

b) Prove that the ratio of two successive amplitudes in an under – damped vibration system is constant. [5+5]

OR

11. A vibrating system consists of a mass of 20 kg, a spring of stiffness 20 kN/m, and a damper. The damping provided is only 30 % of the critical value. Find the natural frequency of damped vibration, and ratio of two successive amplitudes. [10]

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