DIPLOMA IN MECHANICAL ENGINEERING (DME)
DIPLOMA VIEP MECHANICAL ENGINEERING
ADVANCED LEVEL CERTIFICATE COURSE IN MECHANICAL ENGINEERING (DMEVI/ACMEVI)

00450

Term-End Examination

June, 2013

BME-056 : THEORY OF MACHINE

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **any seven** questions. Assume missing data suitably if any, **use** of scientific calculator is permitted.*

1. (a) Define the following terms w.r.t vibration   5
        of mechanical system.
        (i)   Resonance
        (ii) Amplitude
        (iii) Degree of freedom
        (iv) Forced vibration
        (v)   Simple harmonic motion

    (b) Prove that for a free torsional vibration of a   5
        single rotor system natural frequency is
        given by the equation.

$$W_n = \sqrt{\frac{G}{I}\left(\frac{J_1}{l_1} + \frac{J_2}{l_2}\right)}$$

2.   A shaft of circular c/s of diameter 60 mm is   **10**
      supported in two bearing at a distance of 1.2 m.
      A mass of 30 kg is attached to the shaft such that
      its centre of gravity is 8 mm from the axis. The
      mass is placed at a distance 500 mm from left
      hand bearing. To avoid unequal wearing of
      bearing, the designer places the mass in the centre
      of span calculate the reaction at bearing,
      maximum bending moments and bending stresses
      if shaft rotates at 750 rpm.

3.   (a)   Explain the stability of spring controlled   **5**
            Governors.

      (b)   The arms of porter governor are 30 cm long   **5**
            and pivoted on the governor axis. The mass
            of each ball is 10 kg and mass on central
            load of the sleeve is 25 kg. The radius of
            rotation of balls is 15 cm when the sleeve
            begins to rise and reaches a value of 30 cm
            for the maximum speed. Determine speed
            range.

4.   (a)   Derive the equation of mass moment of   **5**
            Inertia of flywheel of an IC Engine.

(b) The turning moment diagram for a multi   5
cylinder IC engine is drawn to the following
scale.

1 cm = 20° crank angle

1 cm = 4 KNm

During one revolution of the crank the areas
with reference to the mean torque line are
3.82,(−3.90),3.95,(−3.38), 4.32,(−3.55)cm²
Determine mass moment of Inertia to keep
the fluctuation of mean speed with in ±3%
with reference to mean speed. Engine speed
is 300 rpm.

5. An open belt drive is required to transmit 25 kW   **10**
from a motor running at 800 rpm. The diameter
of motor pulley is 35 cm. The driven pulley runs
at 350 rpm and is mounted on a shaft which is 4
meters away from the driving shaft. Density of
leather belt is 0.2 gm/cm³. Allowable stress for
the belt material is 350 N/cm². If coefficient of
friction between the belt and pulley is 0.25
determine width of the belt required. The
thickness of the belt is 10 mm.

6. (a) Explain the working of gears for skew shaft   5
with neat sketches.

(b) Determine the sense of rotation of output   5
gear in relation to input gear if a simple gear
train has four gears in which gears 2 and 3
mesh internally whereas other gears have
external meshing.

7. (a) Derive the expression for ratio of tension in   5
         the case of V-belt.

    (b) Explain the working of journal bearing with   5
         a neat sketch.

8. Outside diameter of a square threaded spindle of
    a screw jack is 60 mm. The screw pitch is 14 mm.
    If the coefficient of friction between the screw and
    the nut is 0.25, neglecting friction between the nut
    and the collar, determine.

    (a) Force required to be applied at the end of   5
         tommy bar 1.2 m in length to raise a load of
         25 kN.

    (b) Calculate the efficiency of the screw.   5

9. (a) Explain friction. Is it useful or harmful ? Give   5
         at least five examples for each.

    (b) What do you mean by a kinematic chain,   5
         give the inversion of kinematic chain by at
         least two methods.

10. Explain the working of two governor from the   10
    following :

    (a) Proell Governor

    (b) Wilson Hartnell governor

    (c) Hartung governor

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