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

0 1 4 9 3 Term-End Examination

June, 2015

BME-056 : THEORY OF MACHINES

Time : 2 hours   *Maximum Marks : 70*

Note :   *Question no. 1 is **compulsory**. Answer **four** more questions from the remaining. Use of scientific calculator is permitted.*

1.   Select suitable answer from the given four alternatives.   *7×2=14*

   (i)   For a cricket ball, when it is in air, the degrees of freedom for this ball are equal to

   _____ .

      (a)   two

      (b)   four

      (c)   six

      (d)   eight

(ii) A sliding body on a plane surface has _____ degree(s) of freedom.

(a) one

(b) two

(c) three

(d) four

(iii) A cylinder rolling on a flat surface has a _____ contact.

(a) Point

(b) Line

(c) Both (a) and (b)

(d) None of the above

(iv) Quick Return Ratio = _____ .

(a) $\dfrac{2\pi - \theta}{\theta}$

(b) $\dfrac{\theta}{2\pi - \theta}$

(c) $(2\pi - \theta) \times \theta$

(d) None of the above

(v) Angle of friction is _____ .

(a) $\phi = \sin^{-1} \mu$

(b) $\phi = \tan^{-1} \mu$

(c) $\phi = \cos^{-1} \mu$

(d) $\phi = \cot^{-1} \mu$

(vi) Ratio of tension in flat belt is _____ .

    (a) $T_1 \times T_2 = e^{\mu\theta}$

    (b) $(T_1 - T_2) = e^{\mu\theta}$

    (c) $(T_2 - T_1) = e^{\mu\theta}$

    (d) $\dfrac{T_1}{T_2} = e^{\mu\theta}$

(vii) Gear Ratio in simple gear train is _____ .

    (a) $\dfrac{N_1}{N_4} = \dfrac{t_4}{t_1}$

    (b) $\dfrac{N_4}{N_1} = \dfrac{t_4}{t_1}$

    (c) $N_1 \times N_4 = \dfrac{t_4}{t_1}$

    (d)   All of the above

2. (a)   Describe any three types of kinematic pairs giving examples for each one of them.

    (b)   What is a machine ? What is the difference between machine and mechanism ?   7+7

3. (a)   What is a clutch ? What are the different types of clutches ? Explain in detail about any one type of clutch.

    (b)   What is a bearing ? What are the different types of bearings ? Explain in detail about any one type of bearing.   7+7

4. In a flat belt drive the initial tension is 2000 N. The coefficient of friction between the belt and pulley is 0·3 and the angle of lap on the smaller pulley is 150°. The smaller pulley has a radius of 200 mm and rotates at 500 r.p.m. Find the power in kW transmitted by the belt. *14*

5. Derive an expression for the length of a belt in an open belt drive. *14*

6. The arms of a Porter governor are 25 cm long and pivoted on the governor axis. The mass of each ball is 5 kg and the mass on central load of the sleeve is 30 kg. The radius of rotation of balls is 15 cm when the sleeve begins to rise and reaches a value of 20 cm for maximum speed. Determine the speed range. *14*

7. A shaft of length 0·75 m, supported freely at the ends, is carrying a body of mass 90 kg at 0·25 m from one end. Find the natural frequency of transverse vibration. Assume $E = 200 \text{ GN/m}^2$ and shank diameter = 50 mm. *14*