

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

Term-End Examination

00183

December, 2018

BME-056 : THEORY OF MACHINES

Time : 2 hours

Maximum Marks : 70

Note : Answer any five questions. All questions carry equal marks. Assume missing data suitably. Use of scientific calculator is allowed.

1. Explain any **four** of the following terms : $4 \times 3 \frac{1}{2} = 14$
- (a) Instantaneous centre
 - (b) Law of gearing
 - (c) Rolling friction
 - (d) Involute profile of gear teeth
 - (e) Hammer blow
2. Explain Whitworth Quick Return Mechanism with a sketch. Discuss its application in shaper machines.

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3. Describe the following types of pairs with sketches according to nature of relative motion : $4 \times 3 \frac{1}{2} = 14$

- (a) Sliding pair
- (b) Turning pair
- (c) Rolling pair
- (d) Screw pair

4. Describe the working of the following types of cams : $4 \times 3 \frac{1}{2} = 14$

- (a) Wedge and flat cams
- (b) Radial or disc cams
- (c) Spiral cams
- (d) Spherical cams

5. Derive the efficiency of a square threaded screw. Also prove that the maximum efficiency is given by the equation

$$e_{\max} = \frac{1 - \sin \phi}{1 + \sin \phi},$$

where ϕ represents the friction angle.

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6. The turning moment diagram for a multi-cylinder engine has been drawn to a vertical scale of $1 \text{ mm} = 650 \text{ Nm}$ and a horizontal scale of $1 \text{ mm} = 4.5^\circ$. The areas above and below the mean torque line are $- 28, + 380, - 260, + 310, - 300, + 242, - 380, + 265$ and $- 229 \text{ mm}^2$. The fluctuation in speed is limited to $\pm 1.8\%$ of the mean speed which is 400 rpm . Density of the rim material is 7000 kg/m^3 and width of the rim is 4.5 times its thickness. The centrifugal stress (hoop stress) in the rim material is limited to 6 N/mm^2 . Neglecting the effect of the boss and arms, determine the diameter and cross-section of the flywheel rim.

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7. Write short notes on any *two* of the following : $2 \times 7 = 14$

- (a) Logarithmic Decrement
 - (b) Gyroscope
 - (c) Dynamic Balancing
 - (d) Dynamometer
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