

Diploma in Civil Engineering (DCLE (G))/
Diploma in Mechanical Engineering (DME)
DCLEVI/DMEVI/DELVI/DECVI/DCSVI/
ACCLEVI/ACMEVI/ACELVI/ACECVI/ACCSVI

Term-End Examination

December, 2013

00518

BET-014 : APPLIED MECHANICS

Time : 2 hours

Maximum Marks : 70

Note : *Question No. 1 is compulsory. Attempt any four from the remaining questions. Assume suitable data wherever necessary.*

1. Choose the correct answer from given alternatives in questions (a) to (g) below. **7x2=14**

(a) Which of the following statements is correct ?

- (i) A force is an agent which produces or tends to produce motion
- (ii) A force is an agent which destroys or tends to destroy motion
- (iii) A force may balance a given number of forces acting on a body
- (iv) All of the above

(b) If the resultant (R) of two forces P and Q acting at an angle θ , makes an angle (α) with P, then

(i)
$$\tan\alpha = \frac{P\sin\theta}{P+Q\cos\theta}$$

$$(ii) \quad \tan\alpha = \frac{P\cos\theta}{P + \phi\cos\theta}$$

$$(iii) \quad \tan\alpha = \frac{\phi\sin\theta}{P + \phi\cos\theta}$$

$$(iv) \quad \tan\alpha = \frac{\phi\cos\theta}{P + \phi\cos\theta}$$

(c) If the arm of a couple is doubled, its moment will :

- (i) be halved
- (ii) remain the same
- (iii) be doubled
- (iv) change its direction

(d) A couple consists of :

- (i) two like parallel forces of same magnitude s
- (ii) two like parallel forces of different magnitudes
- (iii) two unlike parallel forces of same magnitudes
- (iv) two unlike parallel forces of different magnitudes.

(e) The moment of inertia of a triangular section of base (b) and height (h) about an axis through its base is given by

$$(i) \quad \frac{bh^3}{12}$$

$$(ii) \quad \frac{bh^3}{18}$$

$$(iii) \quad \frac{bh^3}{36}$$

$$(iv) \quad \frac{bh^3}{64}$$

- (f) A lifting machine having an efficiency less than 50% is known as :
- reversible machine
 - non-reversible machine
 - ideal machine
 - none of the above
- (g) The time of flight of a projectile on a horizontal plane is :

(i) $\frac{2 u \sin \alpha}{g}$

(ii) $\frac{2 u \cos \alpha}{g}$

(iii) $\frac{u \sin \alpha}{g}$

(iv) $\frac{u \cos \alpha}{g}$

2. (a) State clearly the law of moments. 6
- (b) A uniform wheel of 600mm diameter, weighing 5kN rests against a rigid rectangular block of 150mm height as shown in figure 1. Find the least pull, through the centre of the wheel, required to turn wheel over corner A of the block. Also find the reactions of the block. Take all surfaces to be smooth. 8

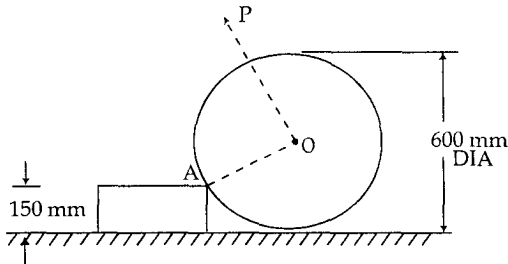
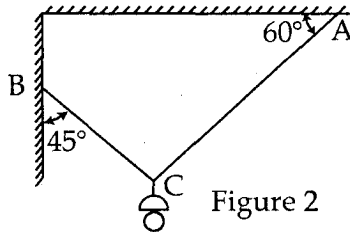
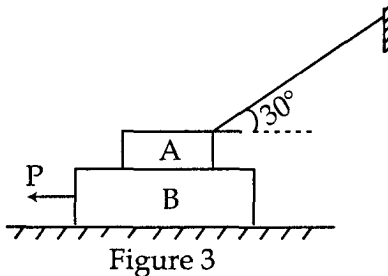


Figure 1

3. (a) Explain the conditions of static equilibrium. 6
 (b) An electric light fixture weighing 15 Newtons hangs from a point by C, two strings AC and BC. The string AC is inclined at 60° to the horizontal and BC at 45° to the vertical as shown in figure 2. Using Lamr's theorem or otherwise determine the forces in strings AC and BC. 8



4. (a) Define coefficient of friction and limiting friction. 6
 (b) Two blocks A and B of weights 1kN and 2kN respectively are in equilibrium as shown in figure 3. If the coefficient of friction between two blocks, as well as the block B and the floor is 0.3, find the force (P) required to move the block B. 8



5. A pin jointed cantilever truss of 3m span is loaded as shown in figure 4. Find the forces in the various members of the framed truss and tabulate the results. 14

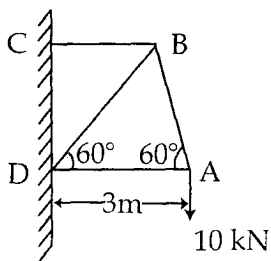


Figure 4

6. (a) What is the law of a machine ? Derive an equation for the same. 6
- (b) In a single purchase winch crab, the number of teeth on pinion is 25 and that on spur wheel is 250, Radii of drum and handle are 150mm and 300mm respectively. Find the efficiency of machine and the effect of friction, if an effort of 20N can lift a load of 300N. 8
7. A bullet is fired upwards at an angle of 30° to the horizontal from a Point 'A' on the hill, and it strikes the target which is 80m below 'A' . The initial velocity of bullet is 10m/s. Calculate the actual velocity with which the bullet will strikes the target. 14