Total No. of Questions – [5] Total No. of Printed Pages: 03

G.R. No.	

U118-1014 (BE-FF)

DECEMBER 2018 / Backlog EXAMINATION

F. Y. B. TECH. (COMMON) (SEMESTER - I)

COURSE NAME: Engineering Mechanics COURSE CODE: CV12176

(2017 PATTERN)

Time: [**2 Hours**] [Max. Marks: **50**]

Instructions to candidates:

1) **Answer Q.1 OR Q.2, Q.3 OR Q.4 and Q.5**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Neat sketches/ diagrams must be drawn wherever necessary.**

Q.1 (a) Determine magnitude and nature of axial forces induced in the members of the truss supported and loaded as shown in Fig. 1 below. [6 marks]

Fig. 1 [Q.1(a)]

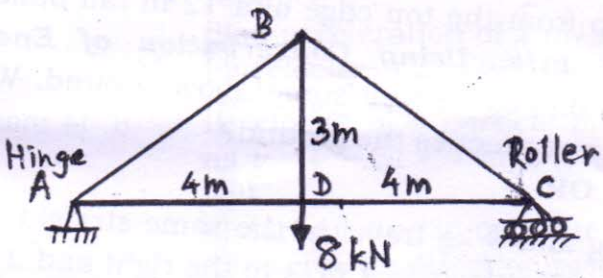
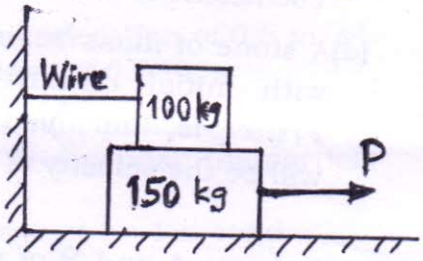


Fig. 2 [Q.1(b)]



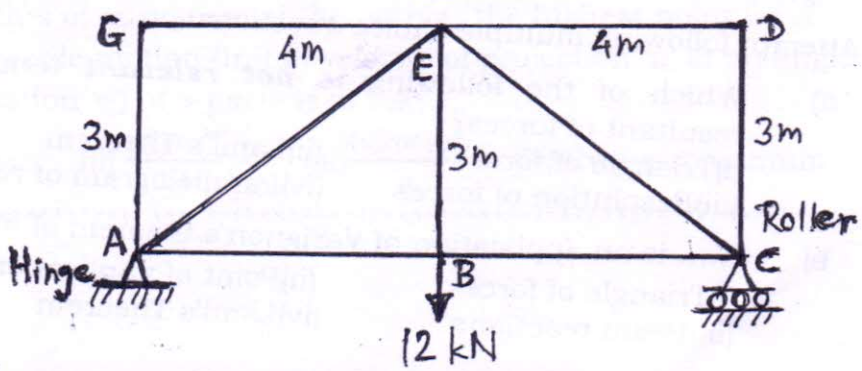
(b) Calculate smallest value of force 'P' for which 150 kg block will just start moving to the right. The 100 kg block is restrained by a horizontal wire as shown in Fig. 2 above. Assume coefficient of static friction = 0.30 for all rubbing surfaces. [6 marks]

(c) A flat belt passes over a 240 mm diameter pulley with angle of contact 150^0. If tight side tension in the belt is 450 N and $\mu = 0.4$ between belt and pulley; find slack side tension and magnitude of torque on the pulley. [4 marks]

OR

Q.2 (a) Find magnitude and nature of axial forces in all members of the truss supported and loaded as shown in Fig. 3 below. [6 marks]

Fig. 3 [Q.2(a)]



(b) Block B of 2 kN weight is just to be lifted by applying minimum force 'F' on the 8^0 wedge of negligible weight as shown in Fig. 4 below. Assume $\mu = 0.35$ for all surfaces. [6 marks]

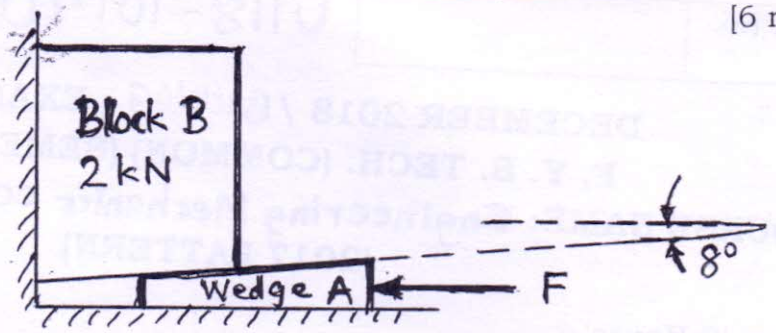


Fig.4
[Q.2(b)]

(c) With the help of suitable sketches explain 'two-force' and 'multi-force' members of structures. [4 marks]

Q.3 (a) A 90 N block is pushed up a 25^0 inclined plane with initial velocity 7.4 m/s. If $\mu = 0.20$ between the block and plane, determine maximum distance the block will travel along the plane before it starts sliding down. ***Use Work-Energy Principle.*** [6 marks]

(b) State various types of impact based on 'coefficient of restitution'. Define 'coefficient of restitution'. [4 marks]

(c) A stone of mass 'm' is thrown up from the top edge of a 12 m tall building with initial upward velocity 8 m/s. ***Using Conservation of Energy Principle,*** find maximum elevation reached by stone above ground. What will be the velocity of stone as it just touches the ground? [4 marks]

OR

Q4 (a) Spheres A and B of masses 6 kg and 9 kg travel in the same straight path on a smooth horizontal surface with velocities 4 m/s to the right and 2 m/s to the left respectively. After impact, if **B** moves to the right with velocity 2.5 m/s; determine (i)velocity of **A** after impact, and (ii)coefficient of restitution 'e' for the impact [6 marks]

(b) Explain with sketches and one practical application: **(i)**Conservation of Energy Principle, and **(ii)**Conservation of linear Momentum. [4 marks]

(c) A block of mass 'm' slides on a rough horizontal floor with initial velocity 'v' and travels maximum distance 'x' before coming to stop. If coefficient of friction between block and floor is 'μ', obtain relation between the parameters in the form: $v = \sqrt{2.x.\mu.g}$ [4 marks]

Q.5 Attempt following multiple choice questions.

a) Which of the following is ***not relevant*** term for finding resultant of forces? [2]
(i)Triangle of forces (ii)Lami's Theorem
(iii)Resolution of forces (iv)Parallelogram of resultant

b) ..... is an application of Varignon's theorem of moments. [2]
(i)Triangle of forces (ii)Point of application of resultant
(iii)Beam reactions (iv)Lami's Theorem

c) If resultant of two forces of 2 kN magnitude is zero, the forces must be ..... [1]
(i)Collinear (ii)Unlike Parallel (iii)Like Parallel (iv)Non-Coplanar

d) For equilibrium of a beam subject to general loading, most appropriate set of equations we must apply is ..... [2]
(i)$\sum F_x = 0, \sum F_y = 0$ (ii)$\sum F_y = 0, \sum M = 0,$
(iii)$\sum F_x = 0, \sum F_y = 0, \sum M = 0$ (iv)$\frac{P}{sin\alpha} = \frac{Q}{sin\beta} = \frac{R}{sin\gamma}$

e) Vertical component of reaction at fixed support for a cantilever beam of 3 m length carrying U. D. L. of 500 N/m will be [2]
(i)7.5 kN (ii)1.5 kN (iii)1 kN (iv)750 N

f) Maximum reaction components at a hinged support are .... [1]
(i)More than Four (ii)Four (iii)Three (iv)Two

g) If an elevator moves up with acceleration 'g' and on the floor of which a box of weight 'm.g' is kept on a weigh balance; the reading on the weigh balance ..... [2]
(i)cannot be measured (ii)will be zero
(iii)will be '2.m.g' (iv)will be '4.m.g'

h) A force of 240 N applied on a body of 120 kg mass will produce ..... [2]
(i)an acceleration of 2 m/s^2 (ii)an acceleration of 0.5 m/s^2
(iii)velocity of 2 m/s (iv)velocity of 0.5 m/s

i) If velocity of a particle moving on straight path is expressed as $v = t^2 - 5t + 4$ m/s (t is measured in seconds); the particle will ..... [1]
(i)start moving in opposite direction once at $t = 1$ second
(ii)reverse its direction twice at $t = 1$ s and at $t = 4$ s
(iii)not reverse its direction of motion
(iv)have constant acceleration

j) If a 2 kg stone is tied at one end of 0.8 m long thread and whirled in a circular path in horizontal plane with linear velocity 0.5 m/s; tension in the string will be ..... [2]
(i)Zero (ii)0.625 N (iii)0.8 N (iv)7.848 N

k) If governing equations for curvilinear motion of a particle are $r = 0.4\ t + 2$ and $\theta = 0.2\ t^2$; radial component of its acceleration at $t = 2$ s will be ..... [2]
(i)- 64 m/s^2 (ii)- 6 m/s^2 (iii)- 0.8 m/s^2 (iv)None of these

l) Radius of curvature of the path at the highest point for a projectile motion (Initial velocity of projection 'u' at an angle of elevation 'θ') of a particle is ..... [1]
(i)Zero (ii) $\frac{u^2.cos\theta}{2g}$ (iii)$\frac{(u.cos\theta)^2}{g}$ (iv)Always maximum

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