Total No. of Questions – [05] Total No. of Printed Pages 04

G.R. No.	

Paper Code - U128-1014 (CBE-FS)

MAY 2019/END SEMESTER EXAM

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

COURSE NAME: Engineering Mechanics

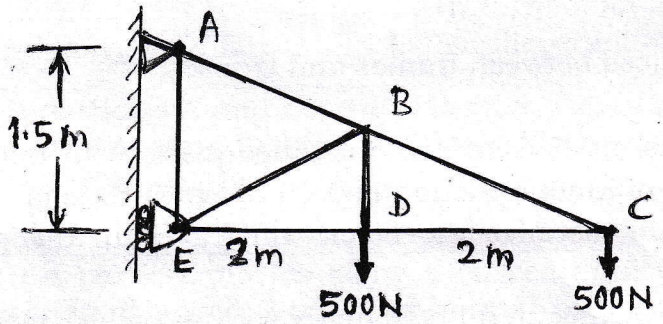
COURSE CODE: CV12176 (2017 PATTERN)

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

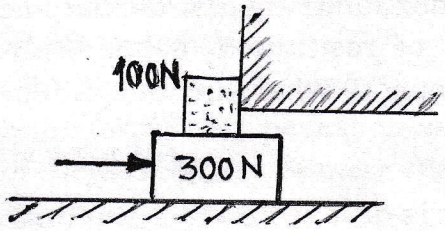
Instructions to candidates:

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) **Use suitable data where ever required and state them clearly.**

Q.1) a) Determine magnitude and nature of forces in all members of the truss shown below. Give answer in usual tabular form. [6 marks]



b) Determine 'P' necessary just to start the 300 N block to the right if coefficient of static friction is 0.30 between all rubbing surfaces. [6 marks]



c) Explain with sketch identification of 'zero-force' members of a truss by inspection (Observation). [4 marks]

OR

Q.2) a) Two light members are pin jointed at B, tied by a wire DE, supported at A and C and loaded as shown below. Find reaction components at A and C. Also find the tension in wire DE. [6 marks]

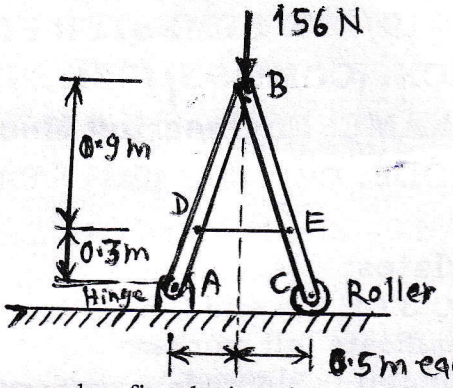


Fig. Not to scale

b) A rope wrapped around a fixed circular shaft such that it makes 2.5 turns over the shaft. It is found that 60 kN load is just kept in equilibrium at one end of rope by applying an effort of 800 N at the other end of rope. Determine coefficient of Static friction between the rope and shaft. Also find number of turns of the rope required if 200kN load is to be just supported by 800 N force. [6 marks]

c) State four differences between frames and trusses. [4 marks]

Q.3) a) A 90 N package is pushed up a 25^0 inclined plane with initial velocity 7.4 m/s. If coefficient of kinetic friction is 0.20 between the plane and package, calculate maximum distance the block will travel up the plane from the initial position. [6 marks]

b) A bullet of 20 gram mass fired horizontally with velocity 100 m/s hits a 2 kg bob (initially at rest) in its path freely suspended in vertical position with the help of a 0.5 m long string. If the bullet gets embedded in the bob due to impact, compute maximum angular displacement of the bob. [4 marks]

c) Define coefficient of restitution 'e', perfectly elastic impact and plastic impact for this impact. What are the minimum and maximum possible values of 'e'. [4 marks]

OR

Q.4) a) A 750 kg pile diver is dropped on to a stationary 200 kg pile. Due to impact, the pile gets driven down in to the ground by 100 mm. If the pile driver does not rebound, determine average soil resistance of soil. **Use Work-Energy principle.** [6 marks]

b) A spring of stiffness 2.5 kN/m is attached to a 3 kg collar which can move freely on a smooth horizontal rod as shown. Knowing that the collar is released from rest from the position shown and the undeformed length of spring is 100 mm, determine velocity of the collar as it passes point C. See figure on the next page. [4 marks]

c) Deduce Impulse-Momentum Principle from Newton's Second Law of motion. [4 marks]

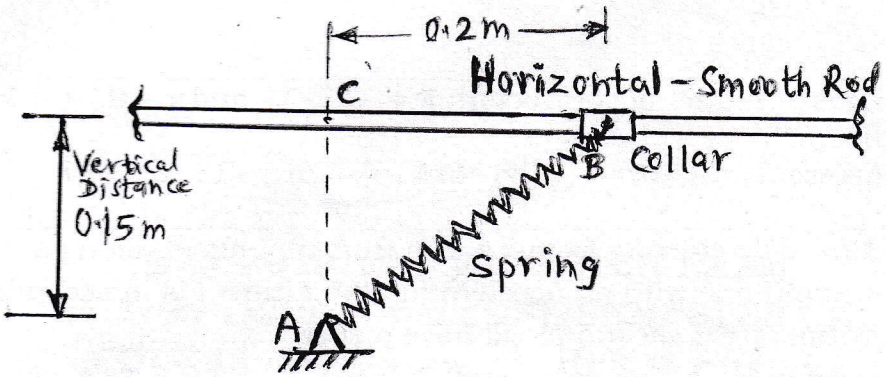


Fig. for Q.4 (b) : Elevation (Front View)

Q.5) Attempt following multiple choice questions: [20 marks]

a)	If the Cartesian (Rectangular) components of a force are 3 kN and 4 kN; their resultant will be ..... (i)7 kN (ii)1 kN (iii)5 kN (iv)Inderterminate	[1]
b)	If one body in equilibrium is placed on the other body in equilibrium; by drawing ..... only the reactive forces can be determined. (i)FBD (ii)Triangle of forces (iii)Polygon of forces (iv)Paralleogram of forces	[1]
c)	If particles A and B have velocities 1 m/s along parallel paths in the same direction; relative velocity of one with respect to the other will be ..... (i)Zero (ii)2 m/s (iii)1 m/s (iv)Indeterminate	[1]
d)	If a particle movies along a curved path of radius 2 m with constant speed 2 m/s, its normal component of acceleration will be ..... (i)Zero (ii)2 m/s^2 (iii)1 m/s^2 (iv)0.5 m/s^2	[1]
e)	Two coplanar concurrent forces have magnitude 'F' each. Identify the **FALSE** statement. (i)Resultant of the forces may be zero (ii)Resultant of the forces may be less than F (iii)Resultant of the forces may be more than 2F (iv) Resultant of the forces may be 2F	[2]
f)	If a 10 N force produces a moment of 75 N-m magnitude about origin 'O'; the shortest distance of the force from 'O' must be ..... (i)Zero (ii)7.5 m (iii)0.75 m (iv)750 m	[2]
g)	A load 'W' acts vertically at the free end of a horizontal cantilever beam of 1.5 m length. If the reaction at fixed support is 4 kN upward; load W and the fixing moment must be ..... (i)4 kN & 6 kN-m (ii)0.4 kN & 0.6 kN-m (iii)4 kN & 0.6 kN-m (iv)0.4 kN & 6 kN-m	[2]

h)	Cross product of two vectors $\mathbf{F} = -3\,i$ and $\mathbf{r} = 2\,j + 4\,k$ will be ..... (i)Zero (ii) $-i + 8k$ (iii) $-6i + 16k$ (iv) $-3\,i + 6\,j + 4\,k$	[2]
i)	A particle starting from x = 1 m from rest moves along a straight line with an acceleration 0.6 t (time t is in seconds). At time t = 2 second it will have a speed ..... (i)2.4 m/s (ii)1.2 m/s (iii) 0.6 m/s (iv) 0.3 m/s	[2]
j)	A 20 kg block has velocity 2 m/s along a smooth horizontal floor. If it impinges on a spring (k = 2 N/mm) initially undeformed, the maximum compression of spring will be ..... (i)1.35 m (ii)0.135 m (iii)2.7 m (iv)0.2 m	[2]
k)	Curvilinear motion of a particle is described by equations x = $2t - 3$ and y = t^2. Hence components of its acceleration in x and y directions will be ..... (i)2 and 3 (ii)0 and 2 (iii)0 and 3 (iv)None of these	[2]
l)	A small block of mass 'm' is placed at radial distance of 'r' from the axis of rotation on a horizontal turn-table. Knowing that coefficient of friction is 'μ' between block and turn-table, limiting linear velocity of the block just to avoid slipping will be given by equation ..... (i)m.g.r.μ (ii)m.g.r^2 (iii)$\sqrt{\mu.g.r}$ (iv) $\sqrt{\mu.m.g.r}$	[2]

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