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

G.R. No.	

Paper code - U127-106 (RE-F4F5)

JUNE 2018/ RE-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) Compute magnitude and nature of axial forces in all members of the truss shown below. Give answer in usual tabular form. [6 marks]

b) Block A supports a 4 kN load and it is just to be prevented from sliding down by a horizontal force P on another block 'B' as shown below. Determine smallest 'P" if coefficient of static friction for all contact surfaces is 0.20, neglecting weights of blocks. [6 marks]

c) A frame is supported and loaded as shown. Determine force on the pin D. [4 marks]

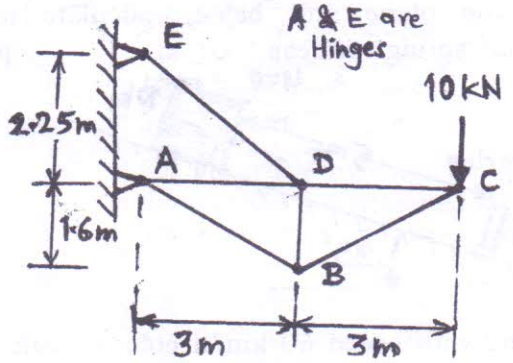


Fig. for Q.1(a)

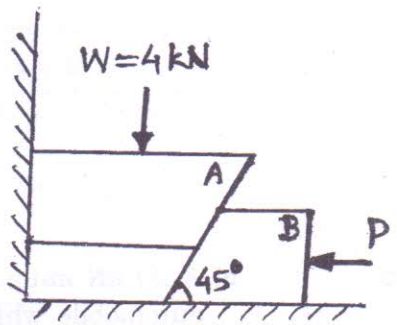
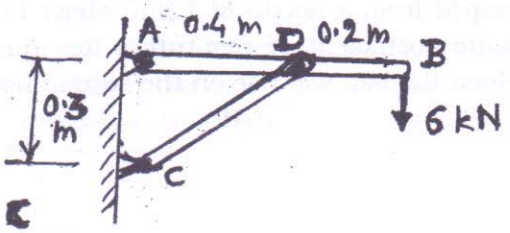


Fig. for Q.1(b)



A and E are Hinges

Fig. for Q.1(c)

OR

Q.2) a) For the frame loaded and supported as shown below, find components of reaction at the supports. Also find force transmitted by pin at B. [6 marks]

b) A band brake arrangement is shown below. Knowing that the drum rotates clockwise about its own axis and coefficient friction μ_s=0.30 between brake and drum, calculate braking ~~force~~ moment on drum. [6 marks]

c) Using method of sections, determine magnitude and nature of axial forces in members DE and BC. [4 marks]

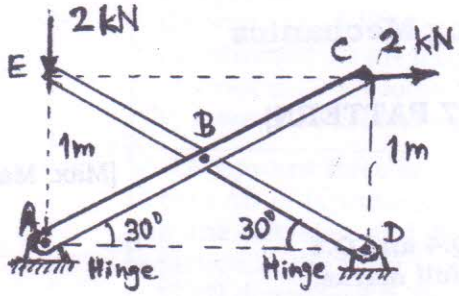


Fig. for Q.2(a)

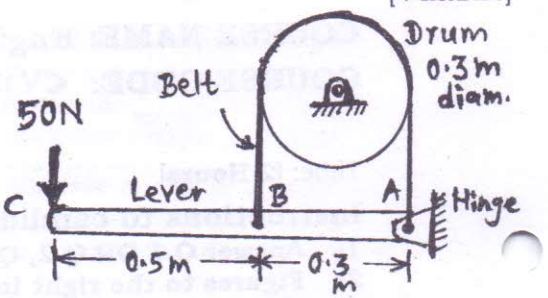


Fig. for Q.2(b)

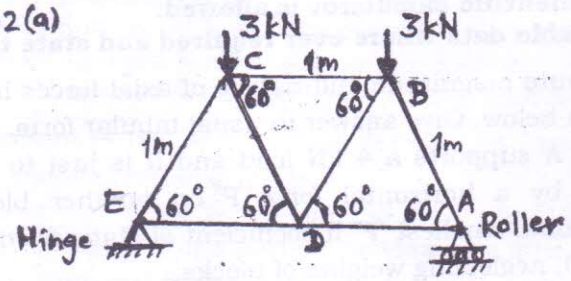
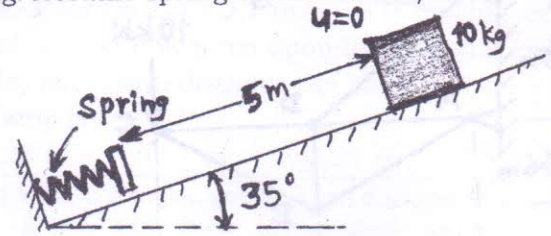


Fig. for Q.2(c)

Q.3) a) A 10 kg block slides down a 35^0 inclined plane. If coefficient of kinetic friction is 0.15 between the plane and block, calculate maximum compression of spring. Assume spring stiffness 1 kN/m. [6 marks]

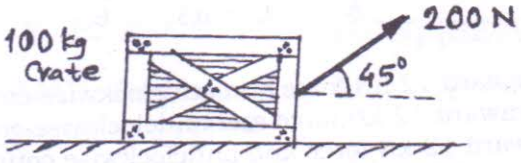


b) A 20 kN automobile traveling with speed 60 km/h collides with a 30 kN automobile which is initially at rest. If they coalesce together, find their common velocity after collision. [4 marks]

c) A 10 g ball dropped from a height of 1.8 m above floor bounces back up to 1.2 m. Determine coefficient of restitution for this impact. Also find the height up to which the ball will rise on the second bounce. [4 marks]

OR

Q.4) a) A force of magnitude 200 N is applied for 10 seconds in inclined direction to a 100 kg crate originally at rest on a smooth floor as shown. **Using impulse-momentum principle,** determine final velocity of the crate and normal force exerted by the floor on crate in this time interval. [6 marks]



b) Sphere 'A' of mass 'm' moving with speed '2u' strikes another sphere 'B' of mass '2m' moving with speed 'u' in opposite direction. Assuming direct central impact between spheres, determine velocity of each sphere in terms of u and coefficient of restitution 'e'. [4 marks]

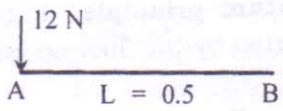
c) (i) Define the terms and write their SI Units: Power, Energy.

(ii) State: Work Energy Principle, Conservation of Energy Principle. [4 marks]

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

a)	Study of forces on a particle or body at rest is called ..... (i)Statistics (ii)Statics (iii)Kinetics (iv)Kinematics	[1]
b)	Drawing ..... is essential for solving the problems on equilibrium of bodies. (i)Force Body Diagram (ii)Freed Bodies Diagram (iii)Free Body Diagram (iv)Folded Body Diagram	[1]
c)	When we apply equation $\bar{V}_{A/B} = \bar{V}_A - \bar{V}_B$ for the motion of cars A and B; conceptually the observer is ..... (i)Far away from car A (ii)Far away from car A (iii)Situated on car A (iv)Situated on car B	[1]
d)	For a particle moving along a curved path, ... moves along the particle (i.e. Attached to the particle). (i)x-y system of coordinates (ii)r-θ system of coordinates (iii)n-t system of coordinates (iv)Space system of coordinates	[1]
e)	Two forces of 6 kN magnitude act at a point. Identify the **FALSE** statement. (i)Resultant of the forces may be zero (ii)Resultant of the forces may be 12 kN (iii)Resultant of the forces may be less than 12 kN (iv)Resultant of the forces may be more than 12 kN	[2]

See Question 5 (f) on the next page...

f)	12 N force acts vertically down on a rigid horizontal member AB of 0.5 m length as shown. The equivalent force-couple system at point B will consist of .....  (i)Downward 12 kN force and anticlockwise couple 6 kN.m (ii)Downward 12 kN force and anticlockwise couple 12 kN.m (iii)Upward 12 kN force and anticlockwise couple 6 kN.m (iv)Upward 12 kN force and anticlockwise couple 12 kN.m	[2]
g)	5 kN upward force is applied at the free end B of a cantilever beam AB of 0.6 m length. Assuming that fixed support A is a on the left side and B is on the right side; identify correct reaction at the fixed support A. (i)5 kN downward & clockwise couple 3 kN.m (ii)5 kN downward & anticlockwise couple 3 kN.m (iii)5 kN upward & clockwise couple 3 kN.m (iv)5 kN upward & anticlockwise couple 3 kN.m	[2]
h)	Resultant of two space forces $\mathbf{F_1} = -7\,i + 8\,j$ and $\mathbf{F_2} = 3\,i - 4\,k$ will make direction angle θ_x = ... (i)66.9^0 (ii)24.3^0 (iii)135.3^0 (iv)114.1^0	[2]
i)	Velocity (in m/s) of a particle moving on a straight path from origin from rest is given by $v = 1.2\,t^2 - 6\,t$ (time t is in seconds). When its acceleration becomes zero, its displacement is ..... (i)x =–7.18 m (ii)x =–12.5 m (iii)x =–2.8 m (iv)x =–7.2 m	[2]
j)	At t=0, a 20 kg block has velocity 2.7 m/s while moving along a rough horizontal floor. If it is acted upon by frictional force of 54 N magnitude, maximum distance the block will travel before coming to stop is ..... (i)1.35 m (ii)0.135 m (iii)2.7 m (iv)0.27 m	[2]
k)	A particle moving with constant speed 3 m/s along a circular path of radius 2 m will have tangential and normal components of acceleration ..... (i)0 and 4.5 m/s^2 (ii)0 and 1.33 m/s^2 (iii)3 m/s^2 and 1.33 m/s^2 (iv)3 m/s^2 and 4.5 m/s^2	[2]
l)	A roller-coaster has velocity 14 m/s at the highest point when it is moving in a vertical circular track. If there is no reaction between the track and roller-coaster at this highest point, radius of circular path must be nearly ..... (i)20 m (ii)12 m (iii)14 m (iv)4.5 m	[2]

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