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

G.R. No.	

Paper Code – U127-106 (ESE)

MAY 2018/END SEMESTER EXAM

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

COURSE NAME: Engineering Mechanics

COURSE CODE: CV12176

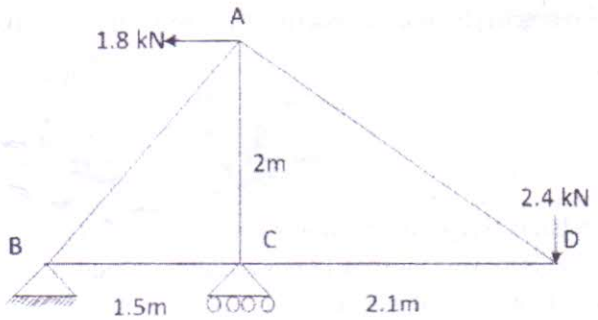
(2017 PATTERN)

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

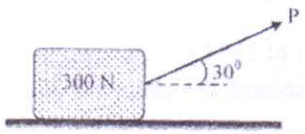
Instructions to candidates:

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 wherever required and state them clearly**

Q.1) a) Using method of joints, determine the force in each member of the truss shown in figure. State whether each member is in tension or in compression. [6 marks]



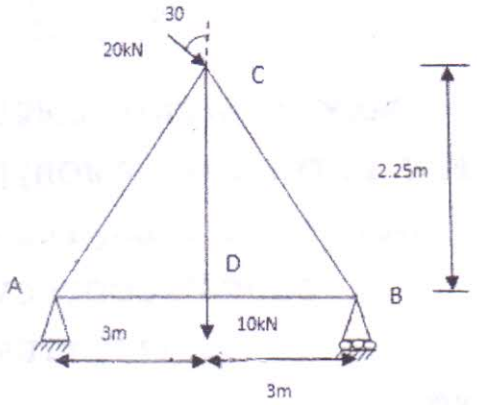
b) A body of weight 300 N is kept on a rough horizontal plane and a force P is applied to just move the body horizontally as shown in Figure. Find the magnitude of force P required if coefficient of static friction is $\mu s = 0.4$. [6 marks]



c) Enlist the assumptions made in the analysis of trusses. [4 marks]

OR

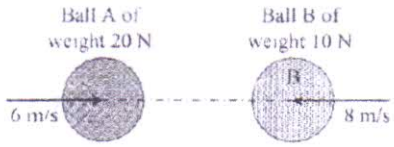
Q.2) a) Find the forces in all the members of the truss shown in Figure. [6 marks]



b) A train has a weight of 2500 kN. The frictional resistance is 7.2 N per kN. Determine the pull exerted by locomotive to increase the speed from 40 km/h to 60 km/h within a period of 2.5 minutes. [6 marks]

c) A body of mass 'm' is projected up a 25^0 inclined plane with initial velocity 15 m/s. If $\mu_s = 0.28$ and $\mu_k = 0.25$, determine how far the body will move up the plane and time required to reach the highest point. [4 marks]

Q.3) a) Balls A and B move along same line in opposite directions with velocities 6 m/s and 8 m/s as shown below. Determine velocities of balls A and B after impact. Weights of ball A and B are 20 N and 10 N respectively. Assume coefficient of restitution = 0.60. [6 marks]



b) A bullet weighs 0.8 N, moves with a velocity of 300 m/s and hits a 50 N wooden block centrally that is moving away at 18 m/s and gets embedded in it. Find velocity of the bullet after the impact and the amount of K.E. lost. [4 marks]

c) State Work Energy Principle. Explain it with suitable example. [4 marks]

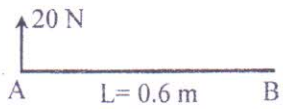
OR

Q4) a) A 1/8 kg bullet travelling at 150 m/s penetrates 125mm into a fixed block of wood. Find the velocity with which the bullet would emerge through a fixed board 60 mm thick. The resistance is uniform in each case. [6 marks]

b) A pile hammer of 250 kg mass is made to fall freely on a pile of height 6 m. If the hammer comes to rest in 0.012 second, determine the change in momentum, impulse and average force. [4 marks]

c) A man throws a 10 kg suitcase with a horizontal velocity of 4 m/s into a 25 kg platform trolley. Determine the velocity of trolley after the suitcase has slid to stop on trolley. [4 marks]

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

a)	A force of 200 N acts at an angle of 20^0 with positive x-axis. Determine its x component. (i)180 N (ii)170 N (iii)185 N (iv) 187.93 N	[1]
b)	Identify the INCORRECT statement. (i)Two forces keeping a member in equilibrium must be equal, opposite and collinear. (ii)Two forces keeping a particle in equilibrium must be equal, opposite and collinear. (iii)Three forces keeping a particle in equilibrium must be all away-going or coming and concurrent. (iv)Three forces keeping a particle in equilibrium must be collinear and equal.	[1]
c)	If speeds of cars A and B moving on parallel roads are 54 km/h but in opposite directions; magnitude of relative velocity of one car with reference to the other will be ..... (i)Zero (ii)54 km/h (iii)108 km/h (iv)$54\sqrt{2}$ km/h	[1]
d)	Angular acceleration of a flywheel starting from rest will be ..... if it attained an angular speed of 12 rad/s in 5 seconds. (i)60 rad/s^2 (ii)0.416 rad/s^2 (iii)2.4 rad/s^2 (iv)1 rad/s^2	[1]
e)	Resultant of two 6 kN forces acting simultaneously at right angles to each at point will be ..... (i) $6\sqrt{2}$ kN at 45^0 (ii) $\frac{6}{\sqrt{2}}$ kN at 45^0 (iii) 12 kN at 45^0 (iv)12 kN at 45^0	[2]
f)	A 20 N vertical force acts at point A on a 0.6 m long rigid member AB as shown. The equivalent force-couple system at point B will consist of .....  (i)Downward 20 N force and clockwise couple 1.2 N.m (ii)Downward 20 N force and anticlockwise couple 1.2 N.m (iii)Upward 20 N force and clockwise couple 1.2 N.m (iv)Upward 20 N force and anticlockwise couple 1.2 N.m	[2]
g)	U. D. L. 5 kN/m acts on entire 1.6 m length AB of beam having simple supports at ends, reactions at supports A and B will be ..... (i)5 kN each (ii)1.6 kN and 5 kN respectively (iii)4 kN each (iv)0.8 kN each	[2]
h)	Resultant of space forces $\mathbf{P}= 3i -2j$ and $\mathbf{Q}= -4i -3k$ will make direction angle θ_x = ... (i)165^0 (ii)15^0 (iii)105.5^0 (iv)74.5^0	[2]

i)	Acceleration (in m/s^2) of a particle moving on a straight path from origin is given as $a = \frac{1}{3}t^3 - 2.75\,t + 6$ (time t is in seconds). The particle will reverse direction of motion at ..... (i) 1 s and 2.75 s (ii)1.5 s and 4 s (iii)0.3 s and 2.75 s (iv) 2.75 s and 6 s	[2]
j)	Apparent weight of a 60 kg person standing in a lift will be .... and .... when lift moves upward and then downward with an acceleration of 2 m/s^2. (i) 708.6 N & 468.6 N resp. (ii) 468.6 N & 708.6 N resp. (iii) 468.6 N & 588.6 resp. (iv) 588.6 N & 468.6 N resp.	[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 particle moves along a circular path of radius 2 m with constant speed 4 m/s. Hence it will have ..... (i)$a_t = 0$ and $a_n = 8$ m/s^2 (ii)$a_t = 8$ m/s^2 and $a_n = 0$ (iii)$a_t = 0$ and $a_n = 2$ m/s^2 (iv)$a_t = 2$ m/s^2 and $a_n = 0$	[2]

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