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

G.R. No.	

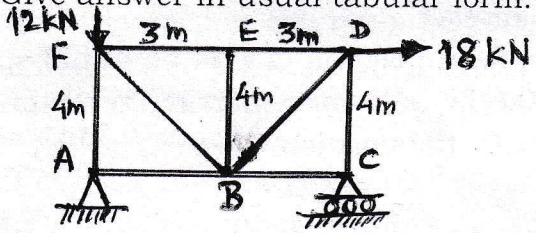
Paper Code - U128-1014 (BE-FF)

MAY 2019/END SEMESTER EXAM (Backlog)
F. Y. B. TECH. (COMMON) (SEMESTER - II)
COURSE NAME: Engineering Mechanics **(2017 PATTERN)**
COURSE CODE: CV12176

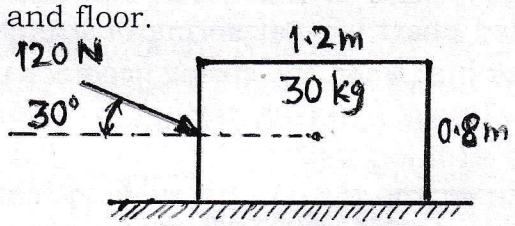
Time: [**2 Hours**] [Max. Marks: **50**]

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]



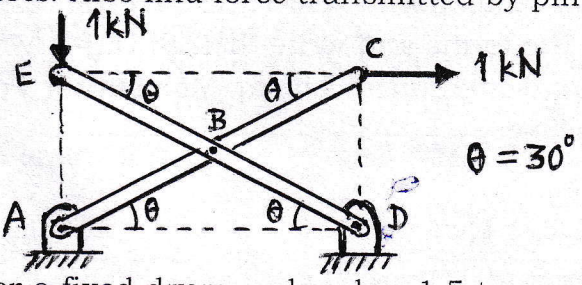
b) A crate kept on a rough floor is acted upon by an inclined force as shown below. Check whether block will maintain static equilibrium if $\mu = 0.30$ between block and floor. [6 marks]



c) Write four differences between Two-Force & Multi-Force members. [4 marks]

OR

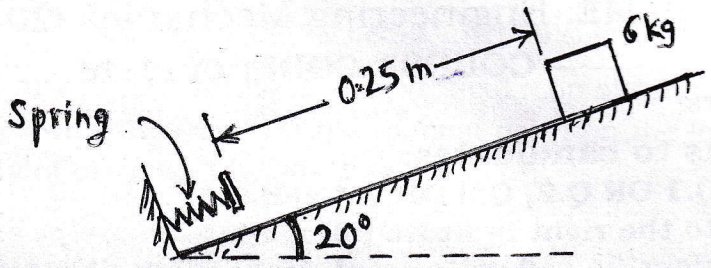
Q.2) a) For the frame loaded and supported as shown below, find components of reaction at the supports. Also find force transmitted by pin at B. [6 marks]



b) A flat belt passes over a fixed drum and makes 1.5 turns around the drum. Find the range of values of weight W at one end of belt that can be just kept in equilibrium by a 100 N force applied at the other end of belt, knowing that angle of friction between belt and drum is 10^0. [6 marks]

c) State four assumptions made in the theory of plane trusses. [4 marks]

Q.3) a) A 6 kg block slides down a 20^0 inclined plane through a distance of x = 0.25 m. If μ_k = 0.251 between the plane and block, calculate maximum compression of spring. Assume k =1.5 kN/m for the spring. [6 marks]

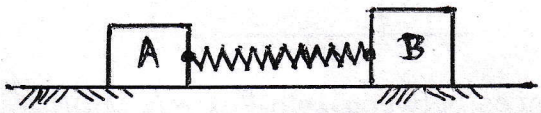


b) Block A (m = 6 kg) traveling with velocity 4 m/s to the right collides axially with block B (m = 9 kg) travelling to the left with velocity 2 m/s. If B moves to the right with velocity 2.5 m/s to the right after impact, find coefficient of restitution for this impact. [4 marks]

c) A 1 kg block starts from position O with an initial speed of 0.8 m/s on to a rough floor (μ_k = 0.60). Determine maximum distance it will travel on the floor with respect to initial position O. [4 marks]

OR

Q.4) a) Blocks A and B (Having masses 40 kg and 60 kg respectively) placed on a smooth horizontal floor are connected by a straight spring (k = 180 N/m). The blocks are pulled apart so that spring is stretched by 2 m. Determine velocity of each block just when the spring becomes unstretched. [6 marks]



b) A 45 Mg railcar 'A' moving with speed 3 km/h is coupled to another railcar 'B' of mass 25 Mg initially at rest. Assuming that coupling takes place in a time of 0.3 second, find velocity of each railcar after coupling. [4 marks]

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

(ii) State: Conservation of Linear Momentum Principle, and Conservation of Energy Principle. [4 marks]

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

a)	Characteristics of a force are ..... (i)Point of application, Line of action (ii)Magnitude, Direction (iii)Neither (i) nor (ii) (iv)Both (i) and (ii)	[1]
b)	If there is a stack of three cylinders in equilibrium and forces a all point of contact are to be determined; how many free body diagrams must be drawn? (i)1 (ii)2 (iii)3 (iv)Can't say	[1]
c)	For relative motion equation $\bar{V}_{A/B} = \bar{V}_A - \bar{V}_B$ for the motion of particles A and B; the observer is conceptually ..... (i)Far away from A (ii)Far away from A (iii)Situated on A (iv)Situated on B	[1]
d)	If a particle moves along a curved path, ... component of acceleration of the particle can never be zero. (i)Normal (ii)Tangential (iii)Coriolis (iv)Uniform	[1]
e)	Two coplanar forces of magnitude 'P' each act at a point. Identify the **FALSE** statement. (i)Resultant of the forces may be zero (ii)Resultant of the forces may be 2P (iii)Resultant of the forces may be less than zero (iv)Resultant of the forces may be more than 2P	[2]
f)	If a vertical force of 10 N magnitude acting on a horizontal rigid member 'AB' of 1.5 m length produces a moment of 7.5 N-m magnitude about 'B'; the force must be acting ..... (i)At point A (ii)At point B (iii)At the mid-point of AB (iv)At any point on the member	[2]
g)	A 10 N force is applied at free end 'B' on a horizontal cantilever beam 'AB' of 1 m length such that the force makes an angle of 45^0 with beam. Identify the correct reactions at the fixed support A. (i)7.07 N horizontal & reactive couple 7.07 N.m (ii)10 N upward & reactive couple 20 N.m (iii)7.07 N horizontal, 7.07 N vertical & a couple 7.07 N.m (iv)7.07 N horizontal, 7.07 N vertical & a couple of 10 N.m	[2]
h)	Resultant of two space forces $\mathbf{F_1} = -7\,i + 8\,j$ and $\mathbf{F_2} = 3\,i - 4\,k$ will be ..... (i)$10i + 12k$ (ii)$4i - 4k$ (iii) $-4i + 8j - 4k$ (iv)$4\,i - 8\,j + 4\,k$	[2]
i)	Velocity (in m/s) of a particle moving on a straight path from origin from rest is given by $v = 1.5\,t^2 - 6\,t$ (time t is in seconds). Its acceleration at t = 1 second will be ..... (i)4.5 m/s^2 (ii)–3 m/s^2 (iii) –4.5 m/s^2 (iv)3 m/s^2	[2]

j)	Mathematically Impulse-Momentum Principle is given as ..... (i)$F.\ dt = m\ (v - u)$ (ii)$m_1.u_1 + m_2.u_2 = m_1.v_1 + m_1.v_2$ (iii)$m.\ dt = F\ (v - u)$ (iv)$m.g.h + (0.5)m.\ v^2 = \text{constant}$	[2]
k)	Curvilinear motion of a particle is described by equation $r = b.\ \sec\theta$. Hence transverse component of its velocity will be given as ..... (i)$b.\sec\theta$ (ii)$-\ b.\sec^2\theta$ (iii)$b.\omega.\sec\theta$ (iv)$-\ b.\omega.\cos\theta$	[2]
l)	If a pilot flying in a small plane in a vertical loop of radius 'r' experiences weightlessness at the highest point on the loop, the velocity of plane will be given as ..... (i)g.r (ii)$\sqrt{g.r}$ (iii) $\sqrt{m.g.r}$ (iv)$1+\sqrt{g.r}$	[2]

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