B.Tech. 3rd Semester (ME) F-Scheme Examination,
December–2016
ENGINEERING MECHANICS
Paper–ME–205–F

Time allowed : 3 hours] *[Maximum marks : 100*

Note : Attempt five questions. ***Question Number 1 is compulsory*** *and attempt at least one question from each section.*

1. Multiple choice questions :

(i) A man stands on a spring weight scale in a lift which carries him upward with acceleration. The reading on the weight scale is

(a) True weight of the man
(b) Lower than true weight
(c) Greater than true weight
(d) Unpredictable

(ii) On which of the following parameters the moment of inertia of a body does not depend

(a) Distribution of mass in the body
(b) Mass of the body
(c) Angluar velocity of the body
(d) All of the above

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(iii) If three forces acting in different planes can be represented by a triangle then these forces

(a) Will be in partial equilibrium

(b) Will be in full equilibrium

(c) Will not be in equilibrium

(d) None of the above

(iv) A particle has to attain a maximum height of 10 m. What will be its initial velocity ?

(a) 18 m/s

(b) 14 m/s

(c) 10 m/s

(d) 7 m/s

(v) The relation between the number of joints and number of members (m) is related by

(a) $m = 2J + 3$

(b) $J = 3m + 3$

(c) $m = 2J - 3$

(d) $J = 3(m - 1)$

(vi) Moment of inertia of a quadrant about X – X axis is given by

(a) $0.055\ R^4$ (b) $0.04\ R^4$

(c) $1.5\ R^4$ (d) $0.075\ R^4$

(vii) Two tensile forces each of magnitude F are acting on a point perpendicular to each other, the resultant force will be

(a) zero (b) $\sqrt{F}$

(c) $\sqrt{2F}$ (d) $\sqrt{2}\ .\ F$

(viii) If the resultant R of two forces P and Q acting at an angle 'θ' with P then

(a) $\tan\theta = \dfrac{P\sin\theta}{P + Q\cos\theta}$

(b) $\tan\theta = \dfrac{P\cos\theta}{P + Q\cos\theta}$

(c) $\tan\theta = \dfrac{Q\sin\theta}{P + Q\cos\theta}$

(d) $\tan\theta = \dfrac{Q\cos\theta}{P + Q\cos\theta}$

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(ix) Relation betwen elastic constant is expressed by

(a) $K = \frac{3\,m\,E}{m-2}$

(b) $K = \frac{m-2}{3\,m\,E}$

(c) $K = \frac{m\,E}{3\,(m-2)}$

(d) None of the above

(x) Poission Ratio is defined as ratio of

(a) $\frac{\text{lateral strain}}{\text{linear strain}}$

(b) $\frac{\text{linear strain}}{\text{lateral strain}}$

(c) $\frac{\text{Young Modulus}}{\text{linear strain}}$

(d) None of above

Section–A

2. Explain what do you mean by moment of a force about a point in a planar force system and explain Varignon's theorem for the moments. 20

3. Draw the free body diagram of (a) the cylinder (b) Rod BC in the figure 1. assuming the floor is smooth. 20

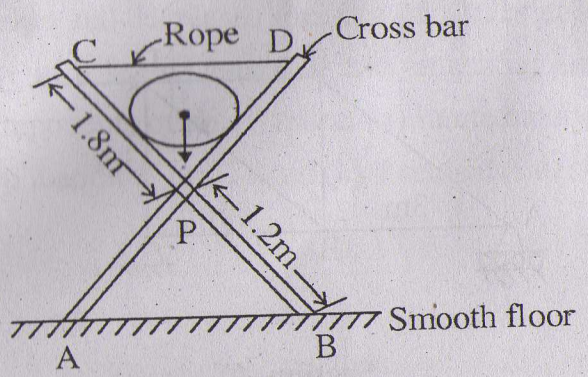


Fig. 1

Section–B

4. Force F is directed from A to B. The magnitude of moment of F about line CD is 50 N-m, determine the magnitude of F. (Fig. C-1) 20

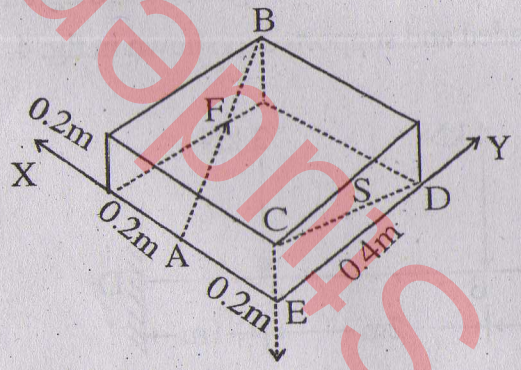
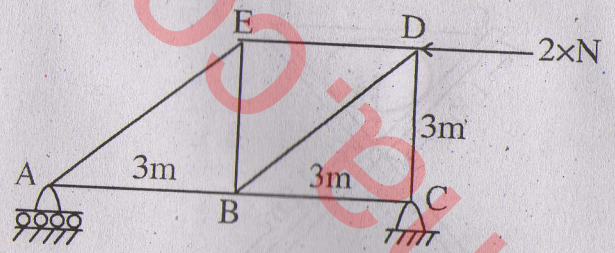


Fig. C-1

5. Calculate the force in each member of the loaded truss. 20



Section–C

6. Define moment of Inertia. State and prove the theorems of moment of inertia. 20

7. Derive the torsion formula relating torque, angle of twist and maximum shear stress produced. 20

8. Draw the shear force and bending moment diagrams for the beam loaded and supported as shown in fig. 4. 20

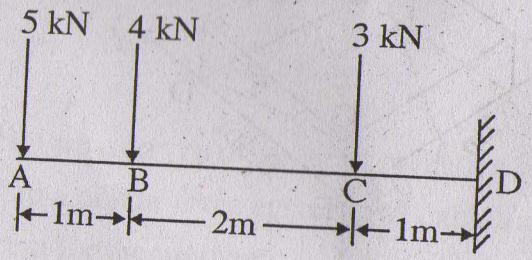


Fig. 4

9. A motorist is driving at 80 Km/hr on the curved portion of a highway of 40 m radius. He suddenly applies the brakes and decreases speed to 45 Km/hr at a constant rate in 8 secs. Determine the tangential and normal components of acceleration (a) immediately after the application of brakes and (b) 4 seconds later. 20