Roll No. .....

24048

B. Tech. 3rd Sem.

Mechanical Engg. (Branch-VII)

Examination – December, 2013

ENGINEERING MECHANICS

'F' Scheme

Paper : ME-205-F

Time : Three hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complain in this regard, will be entertained after examination.

Note : ***Question No. 1 is compulsory.*** Attempt at least ***one*** question from each section. All question carry equal marks.

1. (a) Define truss. frame and centroid. 3

(b) Explain Varignon's principle of moment. 3

(c) What is Equilibrium? Explain conditions of Equilibrium and its types. 3

(d) Define Static Indeterminacy. 3

(e) Define parallel axis theorem. 3

(f) Define point of Contraflexure. 2

(g) Write the Grubbler's equation for a perfect frame. 3

SECTION – A

2. A uniform ladder weighing 80N rests against a smooth vertical wall at a height of 12m above the ground; the foot of ladder being 10m from the wall. Determine the pressure due to wall. 20

3. Forces of 20,30,40,50,60 and 70N act along the side AB, CB, CD, EF and FA respectively of a angular hexagon ABCDEF whose side measure 10cm. Make the calculations for the algebraic sum of moments of the forces about the centre of hexagon and one of the vertices. 20

SECTION – B

4. A triangular plate in the form of an isosceles triangle ABC has the base BC=10 cm and altitude=12 cm. From this plate, a portion in the shape of an isosceles triangle OBC is removed. If O is the midpoint of the altitude of triangle ABC, then determine the distance of CG of the reminder section from the base 20

5. Explain the steps involved while making an analysis of a simple truss by the method of joint and method of section. Explain with the help of suitable example of truss. 20

SECTION – C

6. Determine the moment of inertia of I-section about the centroidal axis parallel to the flange. Top flange= 100 mm × 10 mm, Bottom Flange= 200 mm × 10 mm, Web= 100 mm × 10 mm 20

7. A train weighing 5000kN starts from rest and accelerates uniform to 75km/hr in 40 seconds. If the frictional resistance is estimates to 3kN per 1000kN of the weight of Trains, work out the maximum power required and the power required to maintain the speed of 75km/hr. 20

SECTION – D

8. An object of mass 5kg is projected with a velocity of 20m/s at an angle of 60^{α} to the horizontal. At the highest point of its path, the projectile explodes and breaks up into two fragments of masses 1 kg and 4 kg and these fragments separate horizontally .The explosion releases internal energy such that the kinetic energy of the system at the highest point is doubled. Calculate the separation between two fragments when they reach the ground. 20

9. A beam of span 8.0 m is rested over two simple supports at two ends. The beam is carrying U.D.L. of Intensity 2.0 KN/m up to 4.0 m length from left end. A concentrated load of 5.0 K.N at a distance of 6.0 m

is applied on the beam. Draw S.F.D. and B.M.D. showing important values. Also find point of Contraflexure. 20