Printed Pages: 4   NAG-202/AG-203

B.TECH.

Theory Examination (Semester-II) 2015-16

ENGINEERING MECHANICS

Time : 3 Hours   *Max. Marks : 100*

Section-A

Q1.   Attempt all. Each question carries equal marks.

(10×2=20

(a)   State the Parallelogram law of forces & triangular law of forces.

(b)   Solve the following: A force vector F= 700i + 1500j is applied to a bolt. Determine the magnitude of the force and angle it forms with the horizontal

(c)   List the different types of beams.

(d)   Write the classification of trusses based on the equation M = 2J – 3 where M is number ot members and J is number of joints.

(e)   Distinguish between couple and moment.

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(f) Slate perpendicular axis theorem and write polar moment of ineitia of a hollow circular section of external diameter 'D' and internal diameter 'd'.

(g) What differences exist between Kinetics and Kinematics?

(h) Distinguish between impulse and impulsive force.

(i) Define true stress and Engineering stress.

(j) Define elasticitx and elastic limit.

Section-B

Q2. **Attempt any FIVE. Each question carries equal marks.**
(5×10=50)

(a) A uniform wheel weighing 20 kN and of 600 mm diameter rests against 150 mm thick rigid 7 block as shown in Fig. 1. Considering all surfaces to be smooth, determine (a) the least pull through the center of wheel to just turn the wheel over the corner of the block (b) the reaction of the block.

(b) Prove that belt tension ratio, $T_1/T_2 = e^{\mu\theta}$ where T_1 is the tight side and T_2 is the slack side.

(c) State & prove parallel axis theorem & also derive the expression of mass moment of inertia for Spherical body.

(2)

(d)   Find the forces in each member of the truss as show n in fig. 2.

(e)   Find the centroid for the composite plane section given in fig 3.

(f)   In a slider crank mechanism, the length of crank is 100 mm and that of connecting rod is 300mm. The crank is rotating in clockwise direction at 1200 rpm. Determine the angular velocity of the connecting rod and the velocity of the piston when the crank is making an angle of 300 with the line of stroke.

(g)   Derive the following expression for elastic constants: E = 3K(1-2μ) Where.

E: Young's Modulus of elasticity. K: Bulk modulus, μ: Poisson's ratio.

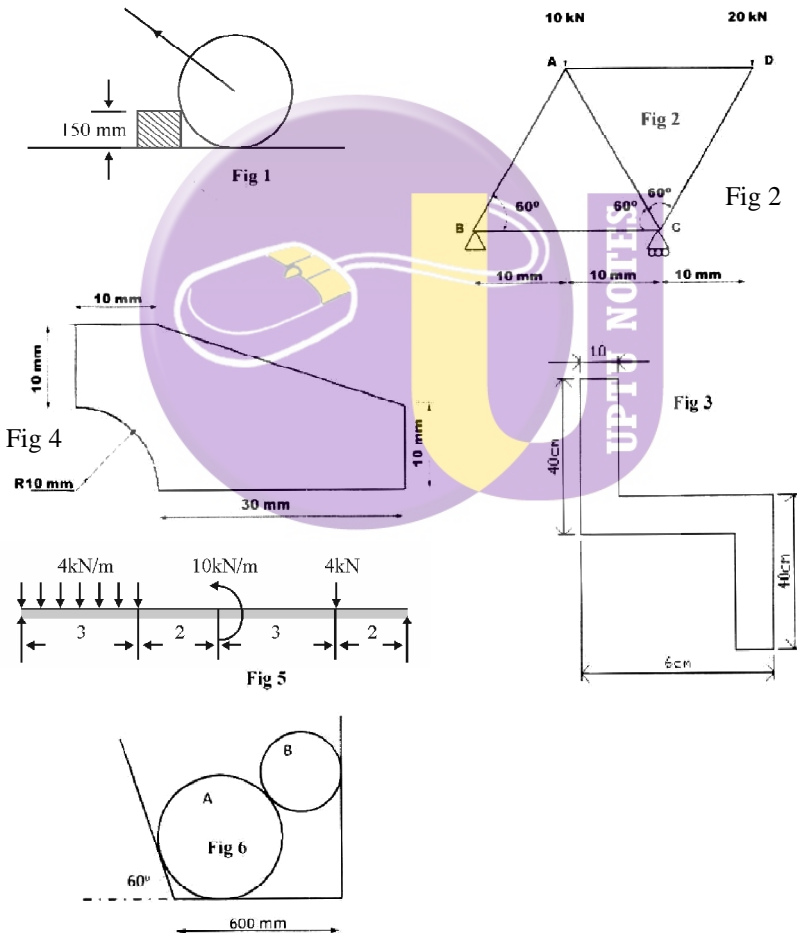(h)   Draw and explain stress strain curve for mild steel.

Section-C

Attempt any TWO. Each question carries equal marks.

(2×15=30)

Q3.   Calculate the Moment of Inertia about the centroidal co-ordinate axes ot plane area shown in fig. 4 and also find Polar Moment of Inertia.

Q4.   Draw the shear force and bending moment diagrams for the simply supported beam as shown in fig.5.

Q5. State and prove law of principle of moments. For the given fig.6 assuming all contact surfaces to be smooth, find the reactions at all contact surfaces. Given data

Cylinders	Diameter	Self-weights
A	500 mm	500N
B	400 mm	200N

150 mm

Fig 1

10 kN   20 kN

A   D

Fig 2

60°

60°   60°

B   C

10 mm   10 mm   10 mm

Fig 2

10 mm

10 mm

Fig 4

R10 mm

30 mm

10 mm

10

Fig 3

40cm

40cm

6cm

4kN/m   10kN/m   4kN

3   2   3   2

Fig 5

B

A

Fig 6

60°

600 mm

(4)