VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGHAUM

ELEMENTS OF CIVIL ENGINEERING & ENGINEERING MECHANICS
MODEL QUESTION PAPER

Sub. Code : 06CIV 13/23 **Exam Marks : 100**

Note: 1. Answer any five full question selecting atleast two questions from each part
2. Answer all objective types questions only in first and second writing pages.
3. Objective types questions should not be repeated.

PART A

1.a., (i) The science of map making is known as

(A) Estimation; (B) Transportation Engg.; (C) town planning;

(D) Surveying

(ii) The part of civil engineering which deals with waste water and solid waste is called

(A) Water supply Engg.; (B) Geotechnical Engg.;

(C) Sanitary Engineering; (D) Structural Engig.

(iii) The bottom most layer of a road is called

(A) Subsoil;**(B) Subgrade;** (C) Base; (D) Surface;

(iv) A bascule bridge is a

(A) Floating bridge; (B) Arch bridge; (C) Suspension Bridge;

(D)Movable Bridge 4

b. Explain in brief the scope of civil engineering 6

c. Briefly explain the impact of infrastructural development on the economic development of the country. 7

d. What is the difference between a dam and a reservoir. 3

2.a. (i) The forces which meet at one point have their line of action in differenent plane are called

(A) Coplanar non-concurrent forces ;**(B) non-coplanar concurrent forces ;** (C) non-coplanar non current forces: (D) none of the above.

(ii) Effect of a force on a body depends upon its

(A) Direction; (B) magnitude; (C) position;**(D) all the above**.

(iii) A number of forces acting simultaneously on a body

(A) may not be replaced by a single force; **(B) may be replaced by a single;** force; (C) may be replaced by a single force through C.G. of the body; (D) may be replaced by a couple

(iv) Principle of transmissibility of forces states that, when a force acts upon a body, its effect is,

(A) maximum if it acts at the centre of gravity of the body;

(B) different at different points on its line of action;

(C) same at every point on its line of action;

(D) minimum if it acts at the C.G of the body. 4

b. Define force and state its characteristics 3

c. State and explain Principle of Transmissibility 4

d. A body weighing 250 N is tied to a smooth wall by a string as in Fig. 1. find the tension T in the string and the reaction R of the wall. 9

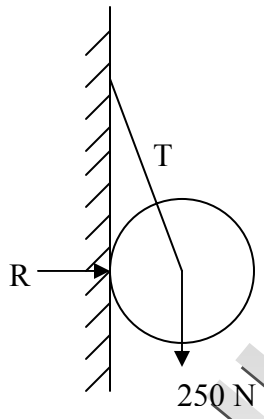


FIG.1

3.a. (i) If a body acted upon by a number of coplanar non-concurrent forces, it may

(A) rotate about itself without moving; (B) move in any one direction;

(C) be completely rest; **(D) all the above.**

(ii) If two forces each equal to T in magnitude act at right angles, their effect may be neutralized by a third force acting along their bisector in opposite direction whose magnitude will be

(A) 2T; (B) ½ T; **(C) $\sqrt{2}$T;** (D) 3T.

(iii) If two forces act at an angle of 120^0. If the greater force is 50N and their resultant is perpendicular to the smaller force, the smaller force is

(A) 20 N; **(B) 25 N;** (C) 30 N; (d) 43.33 N.

(iv) IF two forces P and Q(P>Q) act on the same straight line but in opposite direction, their resultant, is

(A) P+Q ; (B) P/Q ; (C) Q-P; **(D)P-Q.** 4

b. State and Prove Varignon's theorem of moments. 5

c. Determine the magnitude direction and the position of resultant force for the system of forces acting on a square as shown in fig. 2. 11

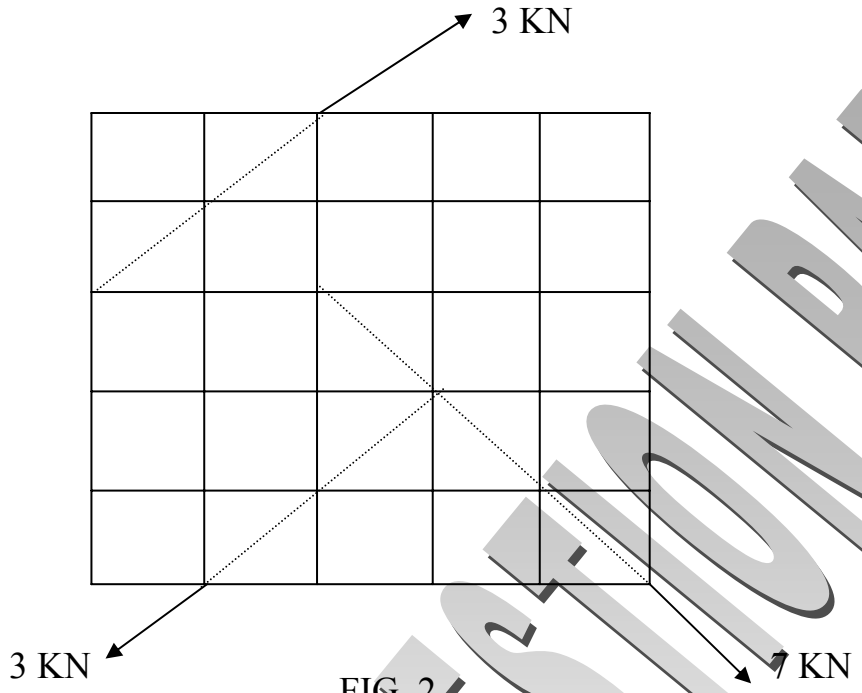


FIG. 2

4.a. (i) The centroid of a plane lamina will not be at its geometrical center if it is a

(A) circle; **(B) right angled triangle;** (C) rectangle; (D) equilateral triangle.

(ii) The centroid of a triangle of height 'h' is located at a distance from its base

(A) h/2; **(B) h/3;** (C) 2h/3; (D) h.

(iii) An axis over which one half of the plane figure is just mirror of the other half, which is

(A) bottom most axis of the figure; **(B) axis of symmetry;**

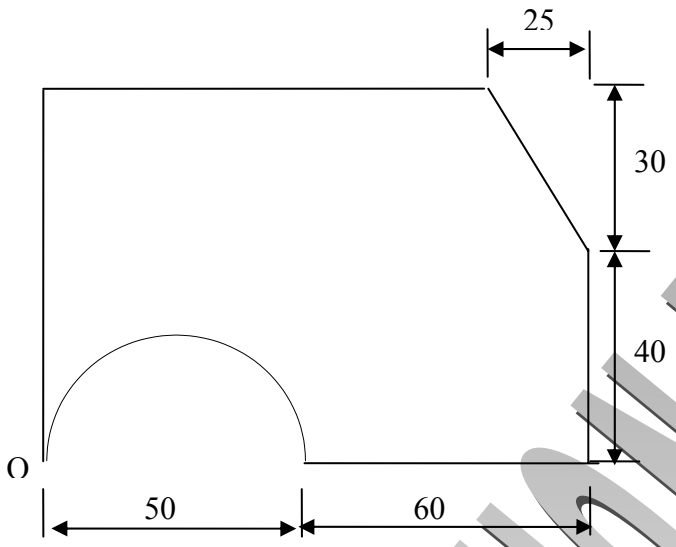
(C) Unsymmertrical axis; (D) none of the above

(iv) The centroid of a semicircle of radius R about its centroidal axix parallel to its diametric axis is,

(A) 3 R/4π; (B) 3R/8π; (C) 4R/ π; **D)4R/3π** 4

b. Determine the center of gravity of a semicircle by method of integration 6

c. Find the coordinates of centroid of the lamina shown below with respect to point O. 10



All Dimensions are in mm

PART B

5.a. (i) The force which is equal and opposite to resultant is

(A) resultant force; (B) force; **(C) equilibriant;** (D) none of the above.

(ii) The necessary condition of equilibrium of a co-planar concurrent force system is, :

(A) algebraic sum of horizontal and vertical forces must be zero;

(B) algebraic sum of moments of the forces about a point must be zero;

(C) algebraic sum of horizontal, vertical forces and moments must be zero;

(D) all the above.

(iii) A system that possesses resultant :

(A) will be in equilibrium; (B) will be under rest; **(C) not be in equilibrium;** (D) none of the above.

(iv) The procedure of resolution is,

(A) to find the resultant of the force system;

(B) to breakup an inclined force into two components;

(C) to find the equilibriant ;

(D) None of the above. 4

b. State and prove Lame's theorem. 3

c. The two identical rollers each weighing 200N are placed as shown in Fig.5. Assuming all contact surfaces are smooth, find the reactions developed at contact surfaces. 13

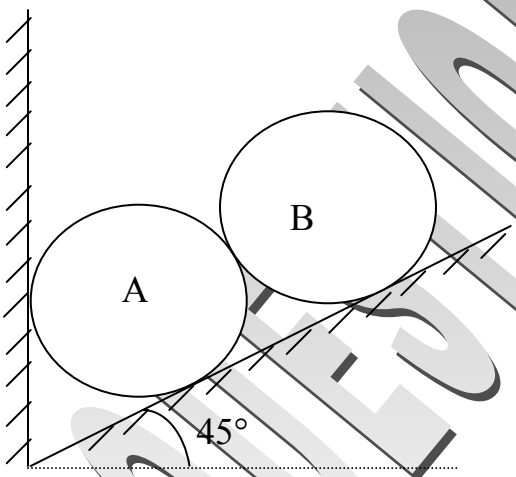


FIG.5

6.a. (i) A cantilever beam is one

(A) One end is fixed and the other if simply supported;

(B) Both ends are fixed; (C) Both ends are roller supported;

(D) one end fixed and the other is free.

(ii) The number of reaction components at an hinged end of a beam are :

(A) 2; (B) 3; (C) 1; (D) all the above.

(iii) udl stands for:

(A) uniform dead load; **(B) uniformly distributed load;** (C) uniform door load; (D) All the above

(iv) Statically determinate beams are,

(A) the beams which can be analyzed completely using static equation of equilibrium;

(B) to beams which can be analyzed without using static equations of equilibrium;

(C) fixed beams ;

(D) None of the above. 4

b. Explain different types of supports and reactions. 6

c. Determine the distance x of the overhanging portion of the beam shown in Fig.6 such that the reactions at the supports are equal. 10

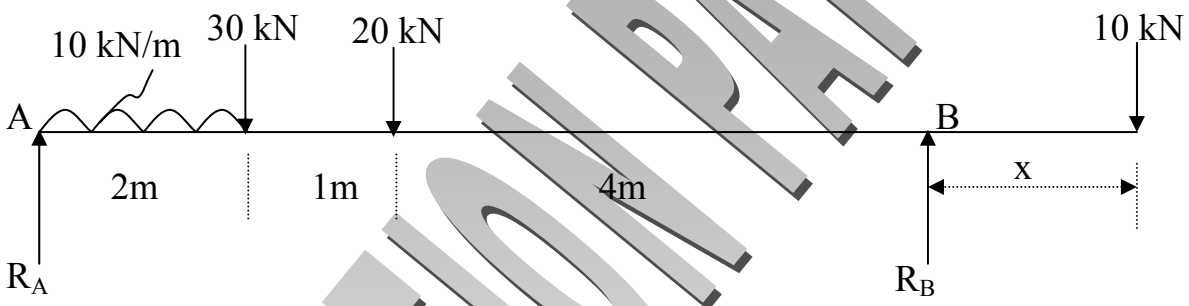


FIG.6

7.a. (i) A heavy ladder resting on a floor and against a vertical wall may not be in equilibrium if

(A) floor is smooth and the wall is rough;

(B) floor is rough and the wall is smooth;

(C) floor and wall both are smooth surfaces;

(D) floor and wall both are rough surfaces.

(ii) Angle of friction is angle between:

(A) the incline and the horizontal;

(B) the normal reaction and friction force;

(C) the weight of the body and the friction force;

(D) the normal reaction and the resultant.

(iii) the force of friction developed at the contact surface is always:

(A) parallel to the plane and along the direction of applied force;

(B) perpendicular to the plane;

(C) parallel to the plane and opposite to the direction of motion;

(D) All the above.

(iv) the Coefficient of friction is equal to

(A) the tangent of cone of friction; **(B) the tangent of angle of friction;**

(C) the tangent of angle of repose; (D) the ratio of resultant to normal. 4

b. Mention the laws of static friction 4

c. A uniform ladder of length 7.0m rests against a vertical wall with which it makes an angle 45°. The coefficient of friction between the ladder and the wall is 1/3 and that between the ladder and the floor ½. If a man, whose weigh is one half of that of the ladder, ascends it, how high will he be when the ladder slips. 12

8.a. (i) The unit of moment of inertia of an area is

(A) N/m; (B) N/m^2; (C) m^2; **(D) m^4**

(ii) the moment of inertia of rectangle plane lamina about its horizontal centroidal axis is:

(A) $bd^3/12$; (B) $bd^3/36$; $bd^3/48$; $db^3/36$

(iii) The moment of a square of side b about an axis through its centroid is:

(A) $b^4/12$; (B) $b^4/8$; (C) $b^4/36$; (D) $b^3/12$;

(iv) The moment of inertia of a thin ring of external diameter D and internal diameter d about an axis perpendicular to the plane of the ring is

(A) $\pi(D^4+d^4)/64$; (B) $\pi(D^4-d^4)/32$; **(C) $\pi(D^4+d^4)/32$**; (D) $\pi(D^4-d^4)/64$ 4

b. State and prove parallel axis theorem. 4

d. Find the polar moment of inertia about an axis passing through its centroid for the section shown below 12