4054

BOARD DIPLOMA EXAMINATION, (C–14)
MARCH/APRIL—2018
DME–FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

Time : 3 hours] [*Total Marks* : 80

PART—A 3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Define *(a)* resultant and *(b)* equilibriam. 1½+1½

2. Write the statement of parallelogram law of forces. 3

3. Define coefficient of friction. 3

4. A body of weight 150 N is placed on a horizoltal plane. It is pulled by a horizontal force of 75 N just causes the body to slide over the horizontal plane. Find the coefficient of friction. 3

5. Write the formulae for moment of inertia of a rectangular plane about its centoridal axes. 1½+1½

6. Define *(a)* amplitude, *(b)* time period and *(c)* frequency. 1+1+1

7. State Newton's second law of motion. 3

8. What is simple machine? Mention any three simple machines. 1½+1½

9. Draw the screw jack diagram and name the parts. 1½+1½

10. What is higher pair? Mention two examples.

<div align="center">

PART—B 10×5=50

</div>

Instructions : (1) Answer *any* **five** questions.
(2) Each question carries **ten** marks.
(3) Answers should be comprehensive and the criteria for evaluation is the content but not the length of the answer.

11. The following forces act at a point:
(a) 25N inclined at 35° towards North of East
(b) 20N towards North
(c) 30N towards North-West
(d) 20N inclined at 20° towards South of West
Find the magnitude and direction of resultant force. 10

12. Find the moment of inertia of the following planar figure about centroid al axes:
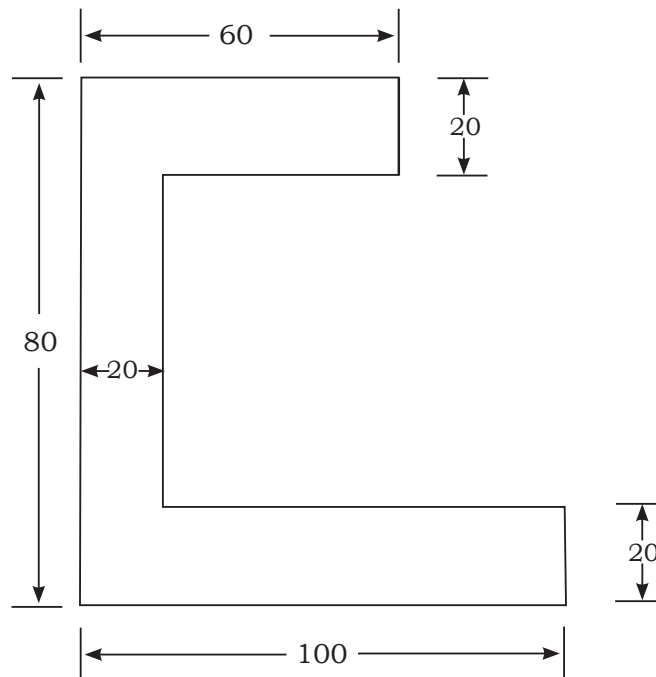
(All dimensions are in mm) 10

13. A body of weight 490.5 rests on a plane, inclined at 20° to the horizontal. A horizontal force of 250N just move the body up the plane. Find the coefficient of friction. 10

14. A wheel rotating at 30 rev/min. is uniformly accelerated for 1.5 minutes during which time it makes 75 revolutions. What is the angular velocity of the wheel at the end of this interval and the further interval required for the wheel to reach an angular velocity of 100 rev/min? 10

15. A bullet of mass 100 grams, is fired into a target with a velocity of 360 m/s. The mass of the target is 9 kg and it is free to move. Find the loss of kinetic energy. 10

16. A screw jack has a mean diameter of 80 mm and pitch of 15 mm. The coefficient of friction between its screw and nut is 0.075. Find the effort required to be normally applied at the end of its operating lever 800 mm long to *(i)* raise a load of 20 kN and *(ii)* lower the same load.
Find the efficiency under this load. 10

17. *(a)* Explain the slider crank mechanism with a neat diagram. 5
   (b) The resultant of two given forces is equal to each of the forces. Find the angle between them. 5

18. *(a)* Calculate the least radius of gyration of a rectangular lamina of size 80 mm × 100 mm. 5
   (b) Explain the rack and pinion simple machine to lift loads by applying effort and derive the VR formula. 5

* * *