3247

BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2014

DME—THIRD SEMESTER 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) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

(4) Assume missing data wherever necessary.

1. A vehicle of mass 1000 kg acquires a velocity of 20 m/s in 10 seconds starting from rest. Find its power.　　3

2. Define simple harmonic motion. Express it mathematically.　2+1

3. Differentiate between scalar and vector quantities.　　3

4. Define *(a)* normal reaction and *(b)* coefficient of friction.　1½+1½

5. Explain the principle of screw jack.　　3

6. Define *(a)* mechanical advantage, *(b)* velocity ratio and *(c)* efficiency.　　3

7. Differentiate between reversible and self-locking machines.

1½+1½

8. The radius of gyration of I-section is 82 mm and its area is 5000 mm^2, find its moment of inertia.　　3

9. Illustrate the centroid of *(a)* rectangle and *(b)* triangle.   1½+1½

10. What is inversion of mechanism?   3

<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 criterion for valuation is the content but not the length of the answer.

(4) Assume missing data wherever necessary.

11. Explain the following types of forces :   2×5

(a) Coplanar forces

(b) Non-coplanar forces

(c) Concurrent forces

(d) Collinear forces

(e) Parallel forces

12. A wheel is rotating at 30 r.p.m. It is uniformly accelerated for 50 seconds during which it makes 40 revolutions. Find—

(a) angular velocity at the end of this interval;

(b) time required reaching a speed of 80 r.p.m.   5+5

13. A body of weight W is in equilibrium on a rough inclined plane, of angle , under the action of an upward pull P applied parallel to base. Write the equations for friction, normal reaction and coefficient of friction. Assume limiting conditions.   10

14. A body resting on a horizontal plane required a pull of 90 N inclined at 30 degrees to the plane just to move it. It was also found that a push of 110 N inclined at 30 degrees to the plane just to move the body. Determine weight of the body and coefficient of friction.   5+5

15. *(a)* Explain briefly the law of machine.   4

(b) An effort of 304 N is required to lift 9800 N and an effort of 598 N is required to lift 19600 N using a simple machine. Find the load lifted using an effort of 157 N on that machine.   6

16. State and prove the parallel axis theorem.

17. *(a)* The resultant of two given forces is equal to each of the forces. Find the angle between the forces.

(b) There are four pulleys arranged in the third system. Find the effort required to lift a load of 5000 N. Assume efficiency of machine as 85%.

18. *(a)* A channel section is made up of the three rectangles taken in order 20 cm × 2 cm, 40 cm × 2 cm and 20 cm × 2 cm. Locate its centroid.

(b) Draw a neat sketch of mechanism of coupling rods of locomotive.

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