Unit-II Worksheet

C2.1 A shaft fitted with a flywheel rotates at 250 r.p.m. and drives a machine. The torque of the machine varies in a cyclic manner over a period of 3 revolutions. The torque rises from 750 N-m to 3000 N-m uniformly during 1⁄2 revolution and remains constant for the following revolution. It thenfalls uniformly to 750 N-m during the next 1⁄2 revolution and remains constant for one revolution, the cycle being repeated thereafter. Determine the power required to drive the machine and percentage fluctuation in speed, if the driving torque applied to the shaft is constant and the mass of the flywheel is 500 kg with radius of gyration of 600 mm.

C2.2 The crank-pin circle radius of a horizontal engine is 300 mm. The mass of the reciprocating parts is 250 kg. When the crank has travelled 60° from I.D.C., the difference between the driving and the back pressures is 0.35 N/mm2. The connecting rod length between centers is 1.2 m and the cylinder bore is 0.5 m. If the engine runs at 250 r.p.m. and if the effect of piston rod diameter is neglected, calculate : 1. pressure on slide bars, 2. thrust in the connecting rod, 3. tangential force on the crank-pin, and 4. turning moment on the crank shaft.

1. With usual notations for different parameters involved, the maximum fluctuations of

energy for a flywheel is given by

a. $2EC_S$ b. $EC_S/2$ c. $2EC_S2$ d. $2E2C_S$

Ans: a

2. Turning moment diagram is a graph between

a. Torque and Crank angle b. Torque and crank radius

c. Force and crank radius d. none of the above

Ans: a

3. Mean resisting torque in Turning Moment diagram is given by

a. Work done per cycle/Angle turned during the cycle

b. Work done per cycle x Angle during the cycle

c. Work done per revolution /Angle during the cycle

d. None of the above

Ans: a

4. The energy is stored in Flywheel in form of

a. Potential energy b. Kinetic energy c. Heat energy d. Electrical energy

Ans: b

5. The radius of Gyration (k) for Rim Type Flywheel having radius ‘r’ is given by

a. k = 2r b. k=r/2 c. k=r d. k=r/3

Ans: c

6. The coefficient of fluctuation of speed of Flywheel is given by

a. (N1-N2)/N b. (N1+N2)/N c. (N1-N2) x N b. (N1+N2) x N

Where N1 =Maximum speed, N2 = Minimum speed, N = Mean speed.

Ans: a

7. The Coefficient of fluctuation of energy of flywheel is given as

a. (Emax – Emin)/Work done per cycle b. (Emax + Emin)/Work done per cycle

c. (Emax – Emin) x Work done per cycle d. (Emax + Emin) x Work done per cycle

Where Emax = Maximum Kinetic energy of the Flywheel.

Emin = Minimum Kinetic energy of the Flywheel

Ans: a

8. Which of the following statement is correct? [GATE-2001]

(a) Flywheel reduces speed fluctuations during a cycle for a constant load, but flywheel does not control the mean speed of the engine if the load changes

(b) Flywheel does not educe speed fluctuations during a cycle for a constant load, but flywheel does control the mean speed of the engine if the load changes

(c) Governor control a speed fluctuations during a cycle for a constant load, but governor does not control the mean speed of the engine if the load change

(d) Governor controls speed fluctuations during a cycle for a constant load, and governor also controls the mean speed of the engine if the load changes

Ans. (a)

9. Consider the following statements: [IAS-2001]

If the fluctuation of speed during a cycle is ± 5% of mean speed of a flywheel, the coefficient of fluctuation of speed will

1. increase with increase of mean speed of prime mover

2. decrease with increase of mean speed of prime mover

3. remain same with increase of mean speed of prime mover

Which of these statement(s) is/are correct?

(a) 1 and 3 (b) 1 and 2 (c) 3 alone (d) 2 alone

Ans. (c)

10. Property of a body due to which it resists any change in its state of rest or motion is

termed as

(a) force (b)momentum (c)velocity (d) inertia

Ans: d

11. In a turning moment diagram, the variations of energy above and below the mean resisting torque line is called

a) fluctuation of energy

b) maximum fluctuation of energy

c) coefficient of fluctuation of energy

d) none of the mentioned

Ans: a

12. The ratio of the maximum fluctuation of energy to the ……. is called coefficient of fluctuation of energy.

a) minimum fluctuation of energy

b) work done per cycle

c) maximum fluctuation of energy

d) none of the mentioned

Ans: b

13. Due to the centrifugal force acting on the rim, the flywheel arms will be subjected to

a) tensile stress

b) compressive stress

c) shear stress

d) none of the mentioned

Ans: a

14. The cross-section of the flywheel arms is usually

a) elliptical b) rectangular c) I-section d) L-section

Ans: a

15. When the torque required by the machine is more than the torque supplied by the motor, the flywheel is

a) Accelerated b) Retarded c) Rotating with constant speed d) Any of the above

Ans: b

16. Flywheel is used in

a) Punch press b) Drilling machine c) Surface grinder d) Milling machine

Ans: a

17. In vehicles, flywheel is placed in between

a) Engine and clutch b) Clutch and Propeller shaft

c) Propeller shaft and Differential d) Before engine

Ans: a

18. Klein's construction gives a graphica construction for

a) slider-crank mechanism b) velocity polygon

c) acceleration polygon d) four bar chain mechanism

Ans: c

19. Klein's construction can be used to determine acceleration of various parts when the crank is at

(a) inner dead centre (b) outer dead centre (c) right angles to the link of the stroke

(d) at 45° to the line of the stroke (e) all of the above.

Ans: e

20. Klein's construction can be used when

(a) crank has a uniform angular velocity (b) crank has non-uniform velocity

(c) crank has uniform angular acceleration (d) crank has uniform angular velocity

Ans: a

21. The force of friction acts in a direction _____ to the direction of motion of object.

(a)Same (b)Opposite (c)Perpendicular (d)Downwards

Ans: b

22. The force of friction depends upon

(a) Nature of surface of contact (b) Material of objects in contact

(c) Both ‘a’ and ‘b’ (d) None of the above

Ans:c

23. The ratio of the limiting force of friction (F) to the normal reaction (R) is known as

(a)Coefficient of friction (b)Force of friction (c)Angle of friction

Ans: a

24. The coefficient of friction (μ) is equal to

(a)TanΦ (b)SinΦ (c)CotΦ (d)CosΦ

Where Φ = angle of friction

Ans:a

25. When the two surfaces in contact have a very thin layer of lubricant in between them, it is known as

(a)Solid friction (b)Rolling friction (c)Greasy friction (d)Film friction

Ans: d

26. The force of friction (F) is equal to

(a)μR/2 (b)μR (c)2μR (d)μR/3

Ans:b