CCE(P) - 2015
MECHANICAL ENGINEERING

KTM-21-XV

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

Subject Code : | 2 | 1 |

Test Booklet No. : 00985

TEST BOOKLET

MECHANICAL ENGINEERING

Time Allowed : 2 (Two) Hours **Full Marks : 200**

INSTRUCTIONS

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Subject Code shall be written legibly and correctly in the space provided on the Answer Sheet with black ball pen.
2. **Space provided for Series in the Answer Sheet is not applicable for Optional Subject. So the space shall be left blank.**
3. All questions carry equal marks. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet.
4. No candidate shall be admitted to the Examination Hall/Room 20 minutes after commencement of distribution of the paper. The Supervisor of the Examination Hall/Room will be the time-keeper and his/her decision in this regard is final.
5. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/ Invigilator. No candidate shall be permitted to hand over his/her Answer Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
6. No Mobile Phone, Pager, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Pager, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
7. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected paper permitted by the Commission.
8. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
9. After you have completed filling in all your responses on the Answer Sheet and the Examination has concluded, you should hand over to the Invigilator *only the Answer Sheet.* You are permitted to take away with you the Test Booklet.
10. Violation of any of the above Rules will render the candidate liable to expulsion from the Examination Hall/Room and disqualification from the Examination, and according to the nature and gravity of his/her offence, he/she may be debarred from future Examinations and Interviews conducted by the Commission for appointment to Government Service.
11. Smoking inside the Examination Hall/Room is strictly prohibited.
12. **This Test Booklet contains one sheet (two pages) for Rough Work at the end.**

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[No. of Questions : 100]

SEAL

CCE (P) - 2015

MECHANICAL ENGINEERING

1. The resultant of two equal forces is equal to either of them. The angle between the forces is

(A) 0°

(B) 60°

(C) 90°

(D) 120°

2. If the resultant of two forces P and Q acting at an angle θ, makes an angle α with the force P, then

(A) $\tan\alpha = P\sin\theta / (P + Q\cos\theta)$

(B) $\tan\alpha = P\cos\theta / (P + Q\cos\theta)$

(C) $\tan\alpha = Q\sin\theta / (P + Q\cos\theta)$

(D) $\tan\alpha = Q\cos\theta / (P + Q\cos\theta)$

3. Which of the following physical quantities is not a vector?

(A) Mass

(B) Momentum

(C) Impulse

(D) Acceleration

4. The acceleration of a particle, moving with simple harmonic motion, at any instant is given by

(A) $\omega \cdot y$

(B) $\omega^2 \cdot y$

(C) ω^2 / y

(D) ω^3 / y

5. When a body moves with simple harmonic motion, the product of its periodic time and frequency is equal to

(A) zero

(B) 1

(C) $\pi / 2$

(D) π

6. The dimensional formula ML^2T^{-3} represents

(A) work

(B) power

(C) force

(D) momentum

7. For perfectly elastic bodies, the value of coefficient of restitution is

(A) 1

(B) 0·5 to 1

(C) 0 to 0·5

(D) zero

8. In simple harmonic motion, the acceleration is proportional to

(A) displacement

(B) linear velocity

(C) angular velocity

(D) rate of change of angular velocity

9. A force which combines two or more forces to produce equilibrium is called

(A) resultant

(B) equilibrant

(C) couple

(D) moment

10. An attempt to turn a key into a lock manifests in the application of

(A) coplanar force

(B) moment

(C) couple

(D) torque

11. An automobile steering gear is an example of

(A) sliding pair

(B) rolling pair

(C) lower pair

(D) higher pair

12. Inversion of a mechanism means

(A) turning it upside down

(B) fixing different links in a kinematic chain

(C) changing a higher pair to lower pair

(D) changing the input and output links

13. If N is the number of links in a mechanism, then the number of possible inversions is equal to

(A) N

(B) $N-1$

(C) $N+1$

(D) $N+2$

14. The relation between number of pairs (p) forming a kinematic chain and number of links (l) is

(A) $l = 2p - 2$

(B) $l = 2p - 3$

(C) $l = 2p - 4$

(D) $l = 2p - 5$

15. The linear velocity of a point B on a link rotating at an angular velocity ω relative to another point A on the same link is

(A) $\omega^2 \cdot AB$

(B) $\omega \cdot AB$

(C) $\omega \cdot (AB)^2$

(D) ω / AB

16. The total number of instantaneous centres of a mechanism having n links is

(A) $n(n-1)/2$

(B) $(n-1)/2$

(C) $n(n+1)/2$

(D) $(n+1)/2$

17. If the mean radius of a rim-type flywheel is halved, its stored energy is _____ of/as the original flywheel at the same speed.

(A) two times

(B) half

(C) same

(D) one-fourth

18. A Hartnell governor is a governor of the

(A) deadweight type

(B) pendulum type

(C) inertia type

(D) centrifugal type

19. The speed range of a Watt governor is

(A) 20 r.p.m. to 50 r.p.m.

(B) 60 r.p.m. to 80 r.p.m.

(C) 80 r.p.m. to 120 r.p.m.

(D) 120 r.p.m. to 200 r.p.m.

20. A Porter governor has maximum and minimum equilibrium speeds of 200 r.p.m. and 150 r.p.m. respectively. If the effective load on the sleeve is 300 N, the governor effort would be

(A) 16·7 N

(B) 58·3 N

(C) 75 N

(D) 100 N

21. A rack is a gear of infinite

(A) pitch

(B) module

(C) diameter

(D) number of teeth

22. An external gear with 60 teeth meshes with a pinion of 20 teeth, module being 6 mm. What is the centre distance in mm?

(A) 120

(B) 180

(C) 240

(D) 300

23. The motion transmitted between the teeth of two spur gears is generally

(A) sliding

(B) rolling

(C) rotary

(D) partly sliding and partly rolling

24. In one revolution of the crank, the maximum value of primary force occurs

(A) twice

(B) three times

(C) four times

(D) six times