PRERNA AVIATION

DGCA CPL Practice Paper 19

Air Navigation - Mass, Balance & Performance

ANSWER KEY & EXPLAINED SOLUTIONS

2026-reviewed sectional practice. Not an official DGCA paper or a verified full-length latest-pattern mock.

01 D	02 B	03 C	04 C	05 B
06 D	07 C	08 A	09 D	10 D
11 A	12 D	13 B	14 A	15 D
16 B	17 D	18 C	19 C	20 A
21 C	22 B	23 A	24 B	25 A

01. An aircraft weighs 800 kg with its CG 2.0 m aft of datum. A 200 kg load is added at 3.0 m. New CG is:

Answer: D. 2.20 m aft of datum

Original moment = 800 × 2 = 1,600 kg m. Added moment = 200 × 3 = 600 kg m. Total moment 2,200 divided by total mass 1,000 gives 2.20 m.

Topic: Loading calculation | Study reference: PERF

02. An aircraft's total moment is 3,360 kg m and total mass is 1,200 kg. CG arm is:

Answer: B. 2.80 m

CG arm = total moment/total mass = 3,360/1,200 = 2.80 m. Both quantities must use compatible units and the same datum.

Topic: CG calculation | Study reference: PERF

03. A 50 kg item is moved 1.5 m forward in a 1,000 kg aircraft. CG movement is:

Answer: C. 0.075 m forward

CG shift = moved mass × distance/total mass = 50 × 1.5/1,000 = 0.075 m. The CG moves in the same direction as the relocated item.

Topic: Load relocation | Study reference: PERF

04. A 1,000 kg aircraft must move its CG 0.10 m aft. A 50 kg item is available for relocation. Required aft movement of the item is:

Answer: C. 2.0 m

Required item movement = total mass × CG shift/item mass = 1,000 × 0.10/50 = 2 m aft, subject to loading and structural limits.

Topic: CG correction | Study reference: PERF

05. An aircraft of 1,100 kg has its CG at 2.4 m. It burns 100 kg of fuel located at 2.4 m. Remaining CG is:

Answer: B. 2.4 m

Removing mass at the existing CG removes moment in the same proportion as mass. Remaining moment = 2,640 - 240 = 2,400 kg m; divided by 1,000 kg gives 2.4 m.

Topic: Fuel burn and CG | Study reference: PERF

06. An aircraft with CG at 2.5 m burns fuel from a tank at 3.0 m aft of datum. Other things equal, CG moves:

Answer: D. Forward

Removing mass behind the current CG shifts the remaining mass distribution forward. The amount depends on fuel mass removed and remaining aircraft mass.

Topic: Fuel tank position | Study reference: PERF

07. A 2.0 m mean aerodynamic chord has its leading edge 1.5 m aft of datum. CG is at 2.0 m aft of datum. CG position as a percentage of MAC is:

Answer: C. 25% MAC

Distance aft of MAC leading edge = 2.0 - 1.5 = 0.5 m. Percentage = 0.5/2.0 × 100 = 25%.

Topic: Percent MAC | Study reference: PERF

08. A CG at 30% of a 2.0 m MAC whose leading edge is 1.0 m aft of datum has arm:

Answer: A. 1.6 m aft of datum

Thirty percent of 2 m is 0.6 m. Add the leading-edge arm: 1.0 + 0.6 = 1.6 m aft of datum.

Topic: MAC conversion | Study reference: PERF

09. Maximum permitted take-off mass for an exercise is 1,200 kg. Basic mass is 750 kg, occupants 240 kg and baggage 30 kg. Maximum fuel mass permitted by this mass limit is:

Answer: D. 180 kg

Available fuel mass = 1,200 - 750 - 240 - 30 = 180 kg. Tank capacity, balance and other limits may impose a lower actual value.

Topic: Mass budget | Study reference: PERF

10. At a stated fuel density of 0.80 kg/L, 180 kg of fuel occupies:

Answer: D. 225 L

Volume = mass/density = 180/0.80 = 225 L. This is a volume calculation, not confirmation that the aircraft tank can carry that quantity.

Topic: Fuel volume | Study reference: PERF

11. A zero-fuel mass limit restricts:

Answer: A. Aircraft mass excluding usable fuel

Zero-fuel mass comprises the aircraft and load excluding usable fuel. Where applicable, its limit protects structural or design constraints separately from take-off and landing mass limits.

Topic: Mass definitions | Study reference: PERF

12. An aircraft may be below maximum take-off mass but still be improperly loaded if:

Answer: D. Its CG is outside the approved envelope

Mass and CG limitations must both be satisfied. Being below the mass limit alone does not prove acceptable balance or performance.

Topic: Loading limits | Study reference: PERF

13. A performance chart gives 600 m take-off distance at one condition. A stated exercise correction adds 10%. Corrected distance is:

Answer: B. 660 m

Ten percent of 600 m is 60 m; add it to obtain 660 m. This is a stated arithmetic exercise, not a universal aircraft correction factor.

Topic: Performance correction | Study reference: PERF

14. Two successive exercise factors of 1.10 and 1.20 apply to a base distance of 500 m. Final distance is:

Answer: A. 660 m

Successive factors multiply: 500 × 1.10 × 1.20 = 660 m. Simply adding the percentages gives a different result because the second factor applies to the already adjusted value.

Topic: Compound factors | Study reference: PERF

15. An AFM performance table provides values for two bracketing temperatures. Linear interpolation should be used:

Answer: D. Only when permitted by the chart instructions and within the applicable range

Interpolation may estimate intermediate values where allowed. Extrapolation beyond published limits is different and must not be assumed valid.

Topic: Chart use | Study reference: PERF

16. For an otherwise identical take-off, a tailwind generally increases required ground distance because:

Answer: B. Ground speed is higher for the same airspeed

Take-off depends on airspeed, while runway distance is travelled over the ground. A tailwind raises ground speed at the relevant airspeed and usually worsens distance performance.

Topic: Wind and take-off | Study reference: PERF

17. High density altitude generally reduces a normally aspirated aeroplane's take-off performance through:

Answer: D. Reduced engine power and reduced aerodynamic/propeller effectiveness

Lower air density reduces available engine power and propeller effectiveness; higher true speed is needed for a given indicated speed. These effects generally increase take-off distance and reduce climb performance.

Topic: Density altitude effects | Study reference: PERF

18. A runway upslope generally tends to:

Answer: C. Increase take-off ground run

Acceleration uphill must overcome an additional component of weight. The approved performance data determine the actual correction for a particular aircraft.

Topic: Runway slope | Study reference: PERF

19. A soft runway surface can lengthen take-off ground roll mainly because of:

Answer: C. Increased rolling resistance

Soft surfaces can increase resistance to wheel movement and may affect handling. Use the aircraft's approved surface corrections and operating limitations.

Topic: Runway surface | Study reference: PERF

20. Best angle of climb speed is selected to maximise:

Answer: A. Height gained per horizontal distance

Best angle concerns climb gradient, whereas best rate concerns height per unit time. Actual speeds and wind effects must be understood from the aircraft data.

Topic: Climb objectives | Study reference: PERF

21. Best rate of climb speed is selected to maximise:

Answer: C. Height gained per unit time

Best rate maximises vertical speed and generally minimises time to a specified height under the applicable conditions. It is different from best angle of climb.

Topic: Climb performance | Study reference: PERF

22. For the same airspeed and climb rate, adding a headwind changes climb gradient over the ground by:

Answer: B. Increasing it

A headwind reduces ground speed. With the same height gained per minute, less horizontal ground distance is covered, increasing height gained per unit ground distance.

Topic: Ground gradient | Study reference: PERF

23. An unpowered aircraft in still air has a lift-to-drag ratio of 10:1. Ignoring manoeuvring and other losses, 3,000 ft of height permits approximately:

Answer: A. 30,000 ft horizontal travel

In a steady glide, horizontal distance per height lost is approximately the lift-to-drag ratio. Thus 3,000 × 10 = 30,000 ft in still air.

Topic: Glide ratio | Study reference: PERF

24. A headwind during a glide at unchanged airspeed generally makes the ground distance achievable from a given height:

Answer: B. Shorter

The air-relative glide path can remain similar while the headwind reduces ground speed. Less ground distance is covered during the available descent time.

Topic: Glide and wind | Study reference: PERF

25. Published performance assumptions matter because actual runway, wind, mass and configuration differences can:

Answer: A. Make the tabulated figure inapplicable without the prescribed adjustments

Performance values are valid under stated assumptions and limitations. Appropriate charts, corrections and procedures must be used for the actual conditions.

Topic: Performance applicability | Study reference: PERF

Study references & review notes

Use these sources to revise the concepts behind your answers. Questions and explanations are newly written; they are not reproduced from an official question bank.

PERF — FAA PHAK, Chapters 10–11: Weight and Balance; Aircraft Performance

https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak

Scope: foundation-to-intermediate CPL ground-subject practice. This set does not claim complete coverage of the latest DGCA syllabus. Consult the current DGCA CAR Section 7, Series B and Pariksha notices for the applicable syllabus and examination requirements. Aircraft-type-specific Technical Specific and a complete RTR(A) course are not included.

FAA references support general theory only, not Indian regulatory requirements. CAP 413 is used for standard phrase meanings, not UK-specific operating rules. Weather reports, fuel reserves and flight scenarios in questions are illustrative. For operational use, consult current approved publications and aircraft manuals.

Reviewed and prepared: 30 October 2026. Official session instructions and syllabus pointers were checked; exact current subject-wise question counts and durations were not independently verified.