PART – B

(AE : AUTOMOBILE ENGINEERING)

SECTION – I

Each question carries *one* mark. 20 × 1 = 2

46. The battery charger which generally employs a rectifier is

(A) constant voltage (B) constant current

(C) high rate (D) slow rate.

47. The most widely used cranking motor drive is

(A) barrel type (B) over running clutch

(C) Bendix drive (D) friction clutch drive.

48. The un-sprung mass of the vehicle includes

(A) the body (B) the engine

(C) the frame (D) the wheels.

49. The pitch-bounce model of an automobile is generally called

(A) full car model (B) half car model

(C) quarter car model (D) $\frac{3}{4}$ car model.

50. Irrespective of the value of damping, when the transmissibility is equal to 1, the rati of frequency of excitation to the natural frequency of the system will be

(A) $\sqrt{2}$ (B) $\sqrt{3}$

(C) $\sqrt{1 \cdot 414}$ (D) 1.

51. The difference between the maximum limit of size and minimum limit of size is called

(A) tolerance (B) upper deviation

(C) lower deviation (D) clearance.

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52. If the dimension of a shaft is expressed as 50 ± 0·05 mm, it is the case of

    (A) unilateral tolerance

    (B) limiting dimension

    (C) bilateral tolerance

    (D) nominal size.

53. Which of the following is not a type of motion control system in CNC operation ?

    (A) Point-to-point

    (B) Straight-out

    (C) Contouring

    (D) Oblique.

54. The Central Computer, Bulk memory, Telecommunication lines and Machine tools are the components of a

    (A) CNC system

    (B) DNC system

    (C) NC system

    (D) CAD system.

55. The output device in CAD does not include in its category

    (A) Plotters

    (B) Hard copy units

    (C) Digitizers

    (D) COM units.

56. A 'square engine' means an engine having

    (A) cylinder of square cross-section

    (B) combustion chamber of square section

    (C) equal bore diameter and stroke length

    (D) piston of square cross-section.

57. The firing order of a 6-cylinder in-line engine is

    (A) 1 – 5 – 4 – 3 – 6 – 2

    (B) 1 – 5 – 3 – 6 – 2 – 4

    (C) 1 – 3 – 2 – 4 – 6 – 5

    (D) 1 – 4 – 6 – 3 – 5 – 2.

58. Valve overlap in an engine occurs between

    (A) intake and compression strokes

    (B) compression and power strokes

    (C) power and exhaust strokes

    (D) intake and power strokes.

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59. For a given piston speed and mean effective pressure, doubling the cylinder diameter would result in

    (A)   increase of power four times   (B)   decrease of power four times

    (C)   decrease of power two times   (D)   increase of power two times.

60. One of the specifications of a battery by the manufacturer is

    (A)   the cranking current   (B)   the colour

    (C)   the weight   (D)   the cranking voltage.

61. In a spring (k) – mass (m) system, when the mass of the spring (m_s) is not small, the expression for the natural frequency of the system ω_n in rad/s will be

    (A) $\sqrt{\dfrac{k}{m}}$ (B) $\sqrt{\dfrac{k}{m + m_s}}$

    (C) $\sqrt{\dfrac{k}{m + \dfrac{m_s}{3}}}$ (D) $\sqrt{\dfrac{k}{m + 3m_s}}$.

62. The equation of motion of a machine [rotating at frequency ω rad/s] of mass M, with an unbalance mass m at radius e is given by

    (A) $m\ddot{x} + c\dot{x} + kx = me\omega^2 \sin \omega t$ (B) $M\ddot{x} + c\dot{x} + kx = me\omega^2 \sin \omega t$

    (C) $M\ddot{x} + c\dot{x} + kx = Me\omega^2 \sin \omega t$ (D) $m\ddot{x} + c\dot{x} + kx = Me\omega^2 \sin \omega t$.

63. In order to increase torque in an automobile, we have to

    (A)   decrease the power   (B)   decrease the fuel supply

    (C)   decrease the speed   (D)   increase the fuel supply.

64. The purpose of transmission in an automobile is to

    (A)   vary the speed of automobile   (B)   vary the torque at the road wheels

    (C)   vary the power of automobile   (D)   vary the speed of engine.

65. When the minimum permitted diameter of the shaft is larger than the maximum allowable diameter of the hole, the resulting type of fit is

    (A)   running fit   (B)   clearance fit
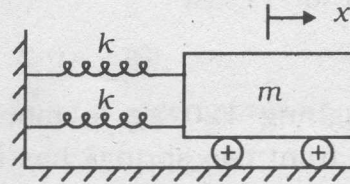
    (C)   transition fit   (D)   interference fit.

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SECTION – II

Each question carries *two* marks.

$10 \times 2 = 20$

66. A mass of $m = 2$ kg is attached to two identical springs, each of stiffness $k = 15$ kN/m as shown in figure. Under frictionless condition, the natural frequency of the system in Hz is close to

(A) 7

(B) 10

(C) 14

(D) 20.

67. A vehicle suspension system consists of a spring and a damper. The stiffness of the spring is 1·8 kN/m and the damping constant of the damper is 200 N-s/m. If the mass is 25 kg, the damping factor (τ) and the damped natural frequency (f_d) are

(A) 0·471 Hz and 1·19 Hz

(B) 0·471 Hz and 7·48 Hz

(C) 0·666 Hz and 1·35 Hz

(D) 0·666 Hz and 8·50 Hz.

68. The new coordinates of the line (2, 2) and (4, 6) after scaling by 2 units in x and y directions are

(A) (3, 4) and (6, 8)

(B) (1, 1) and (3, 3)

(C) (4, 4) and (8, 12)

(D) (2, 2) and (4, 8).

69. In a CNC program block, N002G02 G91 X40 240 ...., G02 and G91 refers to

(A) circular interpolation in counter clockwise direction and incremental dimension

(B) circular interpolation in counter clockwise direction and absolute dimension

(C) circular interpolation in clockwise direction and incremental dimension

(D) circular interpolation in clockwise direction and absolute dimension.

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70. The I.C. engine of an automobile has three cylinders of 68 mm bore and 74 mm stroke. The cubic capacity the engine in c.c. is closest to

   (A) 806   (B) 780   (C) 1074   (D) 269.

71. A turbo charged direct injection diesel engine has displacement volume of 0.0259 m^3 [25.9 litres]. The engine has an output of 950 kW at 2200 rpm. The mean effective pressure [in MPa] is closest to

   (A) 1   (B) 2   (C) 0.2   (D) 0.1.

72. An automotive engine weighing 120 kg is mounted on four springs of linear characteristics. Each of the front two springs has a striffness of 8 MN/m and while the stiffness of each rear spring is 16 MN/m. The engine speed (in rpm) at which resonance is likely to occur is

   (A) 3020   (B) 6040

   (C) 1424   (D) 955.

73. The gear ratios of a four speed gear box are 3.5, 2.1, 1.4 and 1.0. The constant ratio of differential is 6.0. If the engine speed is 4000 rpm and the rear wheel diameter is 0.6 m, the speed of the car (in kmph) in 2nd and 3rd gears respectively are nearly equal to

   (A) 56 and 16   (B) 40 and 27

   (C) 16 and 56   (D) 27 and 40.

74. The speed of an engine varies from 210 rad/s to 190 rad/s. During a cycle, the change in kinetic energy is found to be 800 Nm. The inertia of the flywheel in kgm^2 is

   (A) 0.20   (B) 0.10

   (C) 0.30   (D) 0.40.

75. A shaft has a dimension of $\phi\, 45^{-0.009}_{-0.025}$. The respective values of fundamental deviation and tolerance are

   (A) – 0.025, ± 0.009   (B) – 0.025, 0.016

   (C) – 0.009, ± 0.008   (D) – 0.009, 0.016.

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