LT-2024

Booklet No. 204575

WRITTEN TEST

For Selection to the Post of

Lecturer (Technical) in Electronics & Telecommunication Engineering

Under Higher Education (Technical) Department, Government of Assam

Time : 2:00 PM to 4:30 PM

Series Code

B

QUESTION BOOKLET

INSTRUCTIONS

1. Answer the Questions in the **OMR Answer Sheet** Provided.
2. **Do not Fold/staple the OMR Answer Sheet.**
3. Open the Booklet after the Bell rings at **2:00 PM**
4. **Write and darken** your **Roll Number** carefully in the OMR Sheet Side-1.
5. **Darken the Correct Answer/most suitable Answer in the OMR Answer Sheet using BLACK BALL PEN.**
6. **Please darken the correct option as shown below :**

   Correct : ● ○ ○ ○ Incorrect : ⊗ ⊘ ◎ ◒
7. **Write and darken** your **Question Booklet Series Code [A/B/C/D]** carefully in the OMR Answer Sheet.
8. There are altogether **75 Questions and 24 pages** in the Question Booklet.
9. All Questions are Multiple Choice type Questions (MCQ).
10. **Please check the total number of Questions and Page Numbers of the Question Booklet. In case of discrepancy in this regard, please inform the Invigilator for replacement of the Question Booklet.**
11. **One (1) Mark will be awarded for every Correct Answer** and **for every Wrong Answer, one-fourth (0.25) mark will be deducted.**
12. No candidate will be allowed to leave the Examination Hall temporarily during the Examinations.
13. No candidate can leave the designated seat of the Examination Hall till the end of the examination.
14. **Candidates need to maintain discipline before, during and after the examination.**
15. **Use of Calculators, Cell Phones (mobiles) and other Electronic Gadgets, cameras are strictly prohibited inside the Examination Hall.**
16. The blank spaces and blank sheets attached at the end of the Question Booklet are to be used for rough calculations only.
17. You will be asked by the Invigilator to put your signature and your Left Hand Thumb Impression on the Attendance Sheet & OMR Answer Sheet. Please sign the Attendance Sheet and OMR Answer Sheet in the same way as you signed and uploaded during Online Application which is appearing in your Admit Card.
18. Please submit the OMR Answer Sheet to the Invigilator before leaving the examination hall.
19. Candidature of any candidate will be cancelled if he/she does not follow the guidelines and instructions and if he/she is found to adopt unfair means, in any form as noted by the invigilator/authority.

(TURN THIS PAGE WHEN THE BELL RINGS AT 2:00 PM)

LECTURER (TECHNICAL)
ELECTRONICS & TELECOMMUNICATION ENGINEERING

1. A series RLC circuit has $\omega_0 = 10^4$, $Q = 100$, $R = 200\ \Omega$. The value of C is

   (A) 5n F
   (B) 0.5n F
   (C) 2n F
   (D) 0.2n F

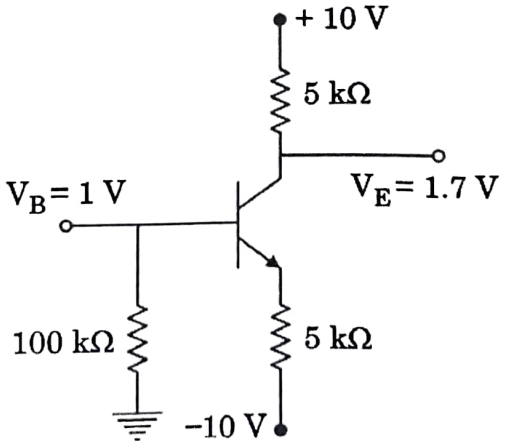
2. A junction transistor operating at room temperature with $I_c = 4\ mA$, $V_T = 26\ mV$ and $\beta = 50$. The value of r_π in ohm is

   (A) 157.5
   (B) 325
   (C) 6.5
   (D) 23

3. A transistor amplifier has a voltage gain of 100, input resistance of $10\ K\Omega$, output resistance of 50 $K\Omega$. The amplifier is now provided 10% negative voltage feedback in series with input. With feedback the voltage gain, input resistance and output resistance will be respectively are

   (A) 9.09, 110 $K\Omega$, 4.545 $K\Omega$
   (B) 9.09, 909 Ω, $550\ K\Omega$
   (C) 11, $10\ K\Omega$, $50\ K\Omega$
   (D) None of the above

4. The value of current gain for the circuit shown is



   (A) 120
   (B) 150
   (C) 165
   (D) 168

5. The radiation resistance of hertzian dipole as radiating element having length $L = 1$ m at frequency of 30 MHz with uniform current distribution is

Ⓐ 9 Ω

Ⓑ 10 Ω

Ⓒ 8 Ω

Ⓓ 4 Ω

6. The cut off frequency for TE_{10} mode of propagation in an air filled rectangular waveguide with broader dimension of 2 cm is

Ⓐ 7.5 GHz

Ⓑ 7.5 MHz

Ⓒ 0.75 GHz

Ⓓ 75 GHz

7. In X-ray lithography, if 'S' is the size of X-ray source, 'g' is the gap between wafer and mask 'D' is the distance between source and mask then the blur is

Ⓐ $\frac{D}{gS}$

Ⓑ $\frac{gS}{D}$

Ⓒ $g - DS$

Ⓓ $\frac{g - S}{D}$

8. S 1: Divergence of curl is zero always and Curl of gradient is always Zero

S2: Gradient of scalar field is a vector and scalar field is said to be harmonic in a given region if its Laplace transform vanishes in that region

Ⓐ S1 is correct and S2 is wrong

Ⓑ S2 is correct and S1 is wrong

Ⓒ Both statements are correct

Ⓓ Both statements are wrong

9. Without using any other gate what are the minimum number of two input NAND and NOR gates respectively used to implement two input EXOR gate

Ⓐ 5, 3

Ⓑ 3, 4

Ⓒ 5, 4

Ⓓ 4, 5

10. S1: ECL is the fastest of all logic families because transistors are allowed to saturate.

S2: ECL uses positive logic system

Ⓐ S1 is correct and S2 is wrong

Ⓑ S2 is correct and S1 is wrong

Ⓒ Both statements are correct

Ⓓ Both statements are wrong

11. Discrete source generates 32 outcomes per-sec have probabilities $p_1 = \frac{1}{2}$, $p_2 = \frac{1}{4}, p_3 = \frac{1}{8}$, $p_4 = \frac{1}{16}, p_5 = \frac{1}{32}, p_6 = \frac{1}{32}$. The information rate of source is (bits/sec)

Ⓐ 31

Ⓑ 62

Ⓒ 78

Ⓓ 93

12. A carrier waveform of 10 w power is simultaneously amplitude modulated by two message signals having modulation indices of 0.3 and 0.4, then power in each sideband resultant signal is

Ⓐ 12.5W

Ⓑ 1.25W

Ⓒ 0.125W

Ⓓ 12.5mW

13. In microwave reflectometer measurement set up the reading of power meter in forward direction is 100 mW and in reverse direction is 4mW. The VSWR is

Ⓐ 0.4

Ⓑ 4

Ⓒ 1.5

Ⓓ 10

14. Transmitting antenna gain has a gain of 10 dB radiating 10 W power. The value of power received by receiving antenna, whose gain is 1 and considering path loss of 100 dB, is

Ⓐ –83 dBW

Ⓑ –80 dBW

Ⓒ 80 dBW

Ⓓ 83 dBW

15. The output signal of a power amplifier has amplitudes of 2.5 V fundamental, 0.25V second harmonic, and 0.1 V third harmonics. The total percentage harmonic distortion of the signal is

Ⓐ 6.4

Ⓑ 12.8

Ⓒ 10.8

Ⓓ 5.4

16. Clampers are also known as

Ⓐ AC restorer

Ⓑ DC restorer

Ⓒ Voltage to frequency converter

Ⓓ Sweep circuits

17. In a cascaded two stage amplifier, each having a gain of 20 dB and noise figure of 20 dB, the overall noise figure is

Ⓐ 400 dB

Ⓑ 40 dB

Ⓒ 20.05 dB

Ⓓ 0 dB

18. The probability density function of the envelope of a sinusoidal signal plus narrowband noise follows which one of the following distribution.

Ⓐ Gaussian

Ⓑ Rayleigh

Ⓒ Uniform and Poisson

Ⓓ Racian

19. In a Pulse Code Modulation system, the number of quantization levels 32. maximum signal frequency is 4 KHz then bit transmission rate is

Ⓐ 40 Kbps

Ⓑ 32 Kbps

Ⓒ 20 Kbps

Ⓓ 16 Kbps

20. Laplace transform and Z-Transform are related by

Ⓐ $S = \ln(Z)$

Ⓑ $S = \frac{\ln(Z)}{T}$

Ⓒ $S = Z$

Ⓓ $S = \frac{T}{\ln(Z)}$

21. The Discrete Fourier Transform of sequence {1, 1, –2, –2} is

Ⓐ {–2, 3 –3 j, 0, 3 + 3 j}

Ⓑ {2, 3 –3 j, 0, 3 + 3 j}

Ⓒ {–2, 3 + 3 j, 0, 3 –3 j}

Ⓓ {–2, –3 –3 j, 0, –3 + 3 j}

22. The Circular convolution of sequence $x_1(n) = \{1, 2, 3, 4\}$ with $x_1(n) = (1, 1, 2, 2)$ is

Ⓐ $\{15, 17, 15, 13\}$

Ⓑ $\{15, 17, 11, 13\}$

Ⓒ $\{15, 11, 15, 13\}$

Ⓓ $\{15, 11, 15, 11\}$

23. The Maximum Usable Frequency of a radio wave whose critical frequency is 6 MHz having a skip distance of 25 Km and virtual height of 100 Km is

Ⓐ 1.25 MHz

Ⓑ 3.25 MHz

Ⓒ 1.025 MHz

Ⓓ 6.046 MHz

24. The semi major axis and semi minor axis of an elliptical satellite orbit are 25000 Km and 20000 Km respectively. Then apogee distance is

Ⓐ 40000 Km

Ⓑ 45000 Km

Ⓒ 5000 Km

Ⓓ 10000 Km

25. A system with open loop transfer function $\frac{100(s+5)(s+30)}{s^4(s+10)(s^2+3s+10)}$ and unity feedback, the type and order of system respectively are

(A) 7, 4
(B) 4, 7
(C) 5, 7
(D) 7, 5

26. The characteristic equation of a control system $s(s+4)(s^2+2s+5)+k(s+1)=0$. The angles of asymptotes for the root loci $k \geq 0$ are

(A) 60°, 180°,300°
(B) 0°, 180°, 300°
(C) 120°, 180°, 240°
(D) 0°, 120°, 240°

27. The open loop transfer function of a unity feedback control system is $\frac{10}{(s+5)^3}$. The gain margin of system is

(A) 20dB
(B) 40dB
(C) 60dB
(D) 80dB

28. The transfer function of lead compensator is $G_c(s)=\frac{1+0.12s}{1+0.04s}$. The maximum phase shift that can be obtained from this compensator is

(A) 60°
(B) 45°
(C) 90°
(D) 30°

29. If the limiting error in the measurement of power and current are ±1.5% are ±1.0% respectively, then limiting error in measurement of resistance will be

(A) ±1.0%
(B) ±1.5%
(C) ±2.5%
(D) ±3.5%

30. The order of an analog low pass Butterworth filter with pass bandattenuation of 3dB, Stopband attenuation of 40dB, Passband and stop band frequency of 500Hz and 1000Hz respectively are

Ⓐ 6 Ⓑ 5

Ⓒ 7 Ⓓ 3

31. In CMOS logic circuit, NMOS acts like an

Ⓐ Pull up network Ⓑ Pull down Network

Ⓒ Load Ⓓ Not used

32. The total types of polymorphism in C++ are

Ⓐ 1 Ⓑ 2

Ⓒ 3 Ⓓ 4

33. The measured half power beam widths (HPBWs) of an antenna in the two orthogonal planes are 60° and 70°. The directivity of the antenna is, approximately

Ⓐ 4.8 dBi Ⓑ 9.9 dBi

Ⓒ 19.2 dBi Ⓓ 24.0 dBi

34. The nature of transmission line with reflection coefficient –1 is

Ⓐ Terminated with Characteristic impedance (Zo)

Ⓑ Open circuited

Ⓒ Short circuited

Ⓓ Line is of infinite Length

35. The Hall coefficient of a P-type semiconductor bar is $R_H = 4 \times 10^2$ cm^3/coulomb, Hole concentration is

Ⓐ 1.56×10^6 Ⓑ 1.56×10^{16}

Ⓒ 0.56×10^{16} Ⓓ 0.56×10^6

36. The free electron density in a conductor is $\frac{1}{1.6}\times10^{-19}/\text{cm}^3$ and electron mobility is $100\,\text{m}^2/(\text{V}-\text{s})$, the value of resistivity is

Ⓐ 10^{-10} ohm-cm Ⓑ 10^{-10} mho-cm

Ⓒ 10^{-6} ohm-cm Ⓓ 10^{-6} mho-cm

37. At very high temperatures N type Semi-conductor behaves as a

Ⓐ P type semiconductor Ⓑ N type semi-conductor

Ⓒ Superconductor Ⓓ Intrinsic semi-conductor

38. The reverse saturation current of biased PN junction diode increases by 64 times due to rise in ambient temperature. If the original temperature was 50°C, then final temperature is

Ⓐ 110°C Ⓑ 100°C

Ⓒ 90°C Ⓓ 120°C

39. A schottky diode clamp in BJT is used for

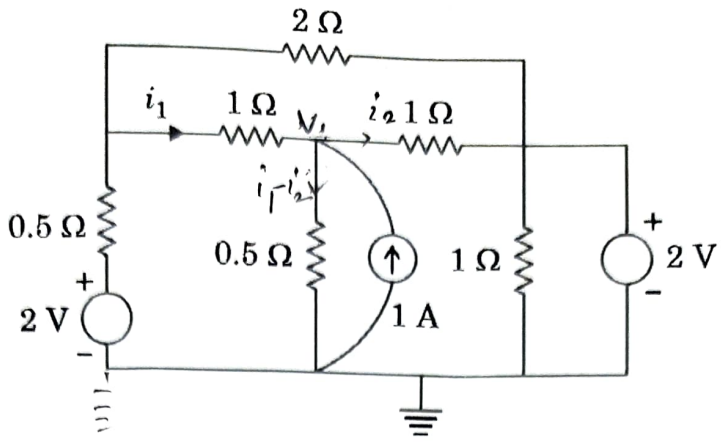
Ⓐ Reducing power dissipation

Ⓑ Reducing base current

Ⓒ Increase the value of current gain

Ⓓ Reducing switching time

40. The value of current i_1 in the circuit given below is



Ⓐ 1.88 A

Ⓑ 0.88 A

Ⓒ 0.576 A

Ⓓ 1.576 A

41. A Coil has inductance of 0.1 H and resistance of 5 Ω is connected in series with capacitor of capacitance 50 μF. An alternating voltage of 200V is applied across the circuit. The magnitude of voltage (Volts) across the coil at resonance is

Ⓐ 1600

Ⓑ 1800

Ⓒ 900

Ⓓ 800

42. A three phase four wire system supplies power to a balanced star connected load, carrying a current of 15A in each phase. The current in neutral wire is

Ⓐ 15 A

Ⓑ 45 A

Ⓒ $15\sqrt{3}A$

Ⓓ 0 A

43. The upper cut off frequencies of two individual stages of cascades amplifier are 5MHz and 3.3 MHz respectively. The equivalent upper cutoff frequency of cascaded amplifier is

Ⓐ 5 MHz
Ⓑ 3.3 MHz
Ⓒ 1.5 MHz
Ⓓ 2.5 MHz

44. The Modified work function of N MOSFET is –0.85V. If the interface charge is $3\times10^{-4}C/m^2$ and oxide capacitance is 300 $\mu F/m^2$, the flat band voltage is

Ⓐ 1.85
Ⓑ 0.15
Ⓒ 3.70
Ⓓ 0.75

45. The absolute potential at a point P which is 2 m from a point charge of $+5\mu C$ is

Ⓐ 22.5 kV
Ⓑ 11.25 kV
Ⓒ 45 kV
Ⓓ 90 kV

46. A graded index optical fiber has parabolic refractive profile. If the fiber has numerical aperture of 0.22, core radius $25\mu m$. The total number of guided modes at a wavelength of 1310 nm is

Ⓐ 1740
Ⓑ 174
Ⓒ 348
Ⓓ 3480

47. Transmission line is open circuit impedance of $150\angle25^\circ\Omega$ and a short circuit impedance of $37.5\angle-35^\circ\Omega$, the value of characteristic impedance is

Ⓐ $75\angle30^\circ$
Ⓑ $75\angle60^\circ$
Ⓒ $75\angle-10^\circ$
Ⓓ $75\angle-5^\circ$

48. Number of Full Adders(F.A) and Half Adders(H.A) required to add 32 bit numbers are

Ⓐ 16 F.A and 16 H.A

Ⓑ 1 F.A and 31 H.A

Ⓒ 31 F.A and 1 H.A

Ⓓ 0 F.A and 32 H.A

49. Number of clock pulses required to change the contents of 8 bit upcounter from 10101100 to 00100111 (consider rightmost bit as LSB)

Ⓐ 134

Ⓑ 133

Ⓒ 124

Ⓓ 123

50. If x, y are two decimal digits in $(0.1101)_2 = (0.8xy5)_{10}$ then decimal value of $x + y$ is

Ⓐ 1

Ⓑ 3

Ⓒ 5

Ⓓ 7

51. Which of the following is not a feature of 8051

Ⓐ 128 bytes of RAM

Ⓑ 4K bytes of on chip ROM

Ⓒ 16 interrupts

Ⓓ Four 8-bit I/O ports

52. Five bit synchronous counter uses flip flops with propagation delay of 20 ms each. The maximum possible time required to change of state will be

Ⓐ 20 ms

Ⓑ 100 ms

Ⓒ 640 ms

Ⓓ 320 ms

53. An audio frequency of 15 KHz is frequency modulated with a deviation of 75 KHz. The resulting bandwidth is

Ⓐ 150 KHz
Ⓑ 210 KHz
Ⓒ 240 KHz
Ⓓ 180 KHz

54. For a material having conductivity of 0.01s/m and permittivity of $3\varepsilon_o$, at what frequency conduction current density is equal to displacement current density?

Ⓐ $\frac{1}{60 \text{ MHZ}}$
Ⓑ 6 MHZ
Ⓒ 60 MHZ
Ⓓ $\frac{1}{6 \text{ MHZ}}$

55. The number of bits in a DAC with a resolution of 0.4% of its full scale range is

Ⓐ 8
Ⓑ 10
Ⓒ 12
Ⓓ 16

56. The number of unused states in 4 bit ring counter and switch tail ring counter respectively are

Ⓐ 4, 8
Ⓑ 12, 8
Ⓒ 8, 4
Ⓓ 8, 12

57. Which gate is used at the input of D flip flop to convert it in to T flip flop

Ⓐ NOR
Ⓑ NAND
Ⓒ EX-NOR
Ⓓ EX-OR

58. The unit step response of a system is given by $\left(1-e^{-\alpha t}\right)u(t)$. The impulse response is given by

Ⓐ $(e^{-\alpha t})\,u(t)$ Ⓑ $\alpha(e^{-\alpha t})\,u(t)$

Ⓒ $\frac{1}{\alpha}\left(e^{-\alpha t}\right)u(t)$ Ⓓ $-\alpha(e^{-\alpha t})\,u(t)$

59. The impulse response of a system is $h(t)=\delta(t-0.5)$. If two such systems are cascaded the impulse response of overall system is

Ⓐ $0.5\delta(t-0.25)$ Ⓑ $\delta(t-0.25)$

Ⓒ $\delta(t-1)$ Ⓓ $0.5\delta(t-1)$

60. If $f(t)=-f(-t)$ and $f(t)$ satisfies dirichlet's conditions, then $f(t)$ can be expanded in Fourier series containing

Ⓐ Only sine terms Ⓑ Only cos terms

Ⓒ Cosine terms and a constant term Ⓓ Sine terms and a constant term

61. The inverse Fourier transform of a function $F(\omega)=\frac{1}{j\omega}+\pi\delta(\omega)$ is

Ⓐ $\sin\omega t$ Ⓑ $\cos\omega t$

Ⓒ $\text{sgn}(t)$ Ⓓ $u(t)$

62. S1: For right handed sequence ROC doesn't includes $Z=\infty$
S2 : For left handed sequence ROC is entire Z-plane expect at $Z=\infty$

Ⓐ S1 is correct and S2 is wrong Ⓑ S2 is correct and S1 is wrong

Ⓒ Both statements are correct Ⓓ Both statements are wrong

63. The square of time period of a satellite in circular orbit of radius 'r' is proportional to

Ⓐ r^2 Ⓑ r^3

Ⓒ $r^{3/2}$ Ⓓ $r^{1/2}$

64. The lowest blind speed of Moving Target indicator radar operating at 5GHz with pulse repetition frequency of 400pps is

Ⓐ 6 m/s Ⓑ 12 m/s

Ⓒ 24 m/s Ⓓ 18 m/s

65. A continuous wave radar operating at 10GHz, the doppler frequency produced by an Airplane flying at a speed of 250Km/hour

Ⓐ 2.31 KHZ Ⓑ 4.62 KHZ

Ⓒ 1.66 KHz Ⓓ 3.32 KHz

66. The characteristic equation of closed loop control system $s^4+6s^3+11s^2+6s+k=0$. The system is stable for

Ⓐ $0<k<10$ Ⓑ $k>10$

Ⓒ $0<k<12$ Ⓓ $-\infty<k<\infty$

67. The percentage peak overshoot of closed loop control system with transfer function $\frac{1}{s^2+s+1}$ is

Ⓐ 84.6% Ⓑ 83.6%

Ⓒ 15.4% Ⓓ 16.4%

68. Voltmeter of 0 – 100V range which is accurate within ± 1.0% is selected for measuring 5V, the error in the measurement is

Ⓐ ±1.5%
Ⓑ ±2.5%
Ⓒ ±20.0%
Ⓓ ±7.5%

69. In a dynamometer ammeter the mutual inductance (M) varies with deflection (θ) as $M = -6\cos(\theta + 30)mH$. The deflection current produced for a current of 50mA corresponding to a deflection of 60° is

Ⓐ 1.5 N-m
Ⓑ 15 N-m
Ⓒ 15 μ N-m
Ⓓ 1.5 μ N-m

70. 100 μA ammeter has an internal resistance of 100 Ω, the value shunt required to measure the current of 500 μA is

Ⓐ 25 Ω
Ⓑ 15 Ω
Ⓒ 10 Ω
Ⓓ 20 Ω

71. The ratio of wattmeter readings in a two wattmeter method for measuring power in a balanced 3-phase circuit is 1 :2, the circuit power factor is

Ⓐ 30°
Ⓑ 0.86
Ⓒ 0.76
Ⓓ 60°

72. S1 : Type 1 Chebyshev filter contain both poles and zeros that exhibit equiripple behavior in the passband a monotonic characteristics in stop band.

S2 : The denominator polynomial of analog low pass Butterworth filter of order Two is $s^2 + 2s + 1$

Ⓐ S1 is correct and S2 is wrong
Ⓑ S2 is correct and S1 is wrong
Ⓒ Both statements are correct
Ⓓ Both statements are wrong

73. Two coils having self-inductance of 15 mH and 20 mH, when connected in series aiding have an effective impedance of 45 mH. What will be the equivalent impedance when connected in series opposing?

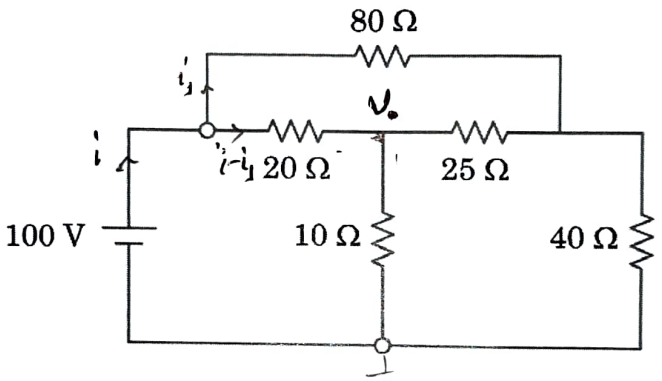
Ⓐ 25 mH

Ⓑ 20 mH

Ⓒ 15 mH

Ⓓ 30 mH

74. For a given circuit the current drawn by 25 Ω resistor is



Ⓐ 4A

Ⓑ 2A

Ⓒ 2.5A

Ⓓ 0A

75. The diffusion length for a charge particle at room temperature with mobility 0.36 $m^2/(V\text{-}s)$ and life time 340 μs is

Ⓐ 2.13 mm

Ⓑ 0.77 mm

Ⓒ 1.77 mm

Ⓓ 1.13 mm