# ME 103

# B.Tech. I[st] SEMESTER EXAMINATION, 2024-25

# B.TECH.

# Fundamentals of Mechanical Engineering & Mechatronics

# (CSE, ME)

# (CBCS Mode)

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Date (तिथि) : _____

**Paper ID**
(To be filled in the OMR Sheet)

**2121**

अनुक्रमांक (अंकों में) :
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अनुक्रमांक (शब्दों में) : _____

Roll No. (In Words) : _____

**Time : 1:30 Hrs.**
**समय : 1:30 घण्टे**

**Max. Marks : 75**
**अधिकतम अंक : 75**

**नोट : पुस्तिका में 50 प्रश्न दिये गये हैं, सभी प्रश्न करने होंगे। प्रत्येक प्रश्न 1.5 अंक का होगा।**

**Important Instructions :**

1. The candidate will write his/her Roll Number only at the places provided for, i.e. on the cover page and on the OMR answer sheet at the end and nowhere else.
2. Immediately on receipt of the question booklet, the candidate should check up the booklet and ensure that it contains all the pages and that no question is missing. If the candidate finds any discrepancy in the question booklet, he/she should report the invigilator within 10 minutes of the issue of this booklet and a fresh question booklet without any discrepancy be obtained.

**महत्वपूर्ण निर्देश :**

1. अभ्यर्थी अपने अनुक्रमांक केवल उन्हीं स्थानों पर लिखेंगे जो इसके लिए दिये गये हैं, अर्थात् प्रश्न पुस्तिका के मुख्य पृष्ठ तथा साथ दिये गये ओ०एम०आर० उत्तर पत्र पर, तथा अन्यत्र कहीं नहीं लिखेंगे।
2. प्रश्न पुस्तिका मिलते ही अभ्यर्थी को जाँच करके सुनिश्चित कर लेना चाहिए कि इस पुस्तिका में पूरे पृष्ठ हैं और कोई प्रश्न छूटा तो नहीं है। यदि कोई विसंगति है तो प्रश्न पुस्तिका मिलने के 10 मिनट के भीतर ही कक्ष परिप्रेक्षक को सूचित करना चाहिए और बिना त्रुटि की दूसरी प्रश्न पुस्तिका प्राप्त कर लेना चाहिए।

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1. Which sensor one should prefer for detecting black objects ?

(A) Ultrasonic sensor

(B) Infrared sensor

(C) PIR sensor

(D) Photoresistor sensor

2. Which factor affects the least while selection of sensor ?

(A) Size

(B) Accuracy

(C) Colour

(D) Durability

3. The thermodynamics cycle in which the petrol engine work, is -

(A) Otto cycle

(B) Jolue cycle

(C) Rankine cycle

(D) None

4. In a domestic refrigerator, periodic defrosting is required because frosting -

(A) Causes corrosion of material

(B) Reduce heat extraction

(C) Over cools food stuff

(D) Partially blocks refrigerant flow



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5. If compression ratio is kept same then thermal efficiency of -

(A) Otto cycle < Dual cycle

(B) Otto cycle < Diesel cycle

(C) Otto cycle = Diesel cycle

(D) Otto cycle > Diesel cycle

6. The stroke of an engine is the -

(A) Volume of the cylinder

(B) Length of the connecting rod

(C) Internal diameter of the cylinder

(D) Distance between TDC and BDC

7. Compression ratio of diesel engines is in the range of -

(A) 8 to10

(B) 10 to 15

(C) 16 to 20

(D) 21 to 30

8. What is the unit of specific gravity ?

(A) $kg/m^3$

(B) $N/m^3$

(C) $m/s^2$

(D) Dimension less



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9. Which process is not associated with Diesel cycle ?

(A) Constant pressure

(B) Constant volume

(C) Adiabatic

(D) Isothermal

10. The air-fuel ratio in petrol engines is controlled by -

(A) Governor

(B) Injector

(C) Controlling value

(D) Carburetor

11. Newton's law of viscosity states that -

(A) Shear stress is directly proportional to velocity

(B) Shear stress is directly proportional to velocity gradient

(C) Shear stress is directly proportional to shear strain

(D) Shear stress is directly proportional to viscosity

12. The viscosity of a liquid is -

(A) Increases with temperature

(B) Decreases with temperature

(C) First increase then Decrease

(D) Remains constant with temperature



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13. Kinematic viscosity is equal to -

(A) Density/ dynamic viscosity

(B) Dynamic viscosity density

(C) Dynamic viscosity/ Density

(D) None of these

14. Which of the following is true for a heat pump and a refrigerator ?

(A) A refrigerator removes heat to achieve cooling

(B) A heat pump supplies heat at high temperature

(C) Both of the mentioned

(D) None of the mentioned

15. Which of the following is not an application of Bernoulli's is equation ?

(A) Venturimeter

(B) Orific

(C) Pitot tube

(D) Aneamometer

16. In Bernoulli's equation $\frac{P}{\rho g} + \frac{V^2}{2g} + Z$, each term represents :

(A) Energy per unit mass

(B) Energy per unit volume

(C) Energy per unit weight

(D) Energy per unit density



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17. What is the compression ratio of SI engine ?

(A) 6:10

(B) 3:5

(C) 1:2

(D) 11:15

18. Which of the following is assumption of Bernoulli's equation ?

(i) The fluid is ideal

(ii) The flow is unsteady

(iii) The flow is incompressible

(A) Only (i) and (ii)

(B) Only (i) and (iii)

(C) Only (ii) and (iii)

(D) (i), (ii) and (iii)

19. A stagnation point is a point where -

(A) Pressure is zero

(B) Total energy is zero

(C) Total energy is maximum

(D) Velocity of flow reduces to zero

20. Which of the following medium is compressed in a Diesel engine cylinder ?

(A) Air alone

(B) Air and fuel

(C) Air and lube oil

(D) None of these



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21. In a flow total head is 35m. Kinetic head is 2.5m and datum head is 5m. then what is the pizometric head ?

(A) 27.5 m

(B) 30 m

(C) 32.5

(D) 25

22. Where and when was the word Mechatronics invented ?

(A) Japan (1860)

(B) Germany (1860)

(C) Japan (1960)

(D) Germany (1960)

23. What are transducers ?

(A) They convert power from one form to another

(B) They convert work from Heat loss

(C) They convert work to power

(D) They convert energy from one form to another

24. The main function of Actuator is -

(A) To produce motion

(B) Detect input

(C) Detect output

(D) Detect the state of the system



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25. Which among the following is correct statement regarding "mechatronic system" ?

(A) Its initial cost setup is low

(B) Cheaper maintenance

(C) More output is less time

(D) Any individual can operate these systems

26. What type of energy conversion does a piezoelectric transducer perform ?

(A) Mechanical to sound energy

(B) Mechanical to electrical energy

(C) Electrical to mechanical energy

(D) Sound energy to mechanical energy

27. PIR stands for -

(A) Passive infrared

(B) Pulsating infrared

(C) Pulsating Ratio

(D) Pulsating Radiation

28. What is the frequency range of ultrasonic sound waves used by the ultrasonic sensor ?

(A) 20 kHz to 25 kHz

(B) 25 kHz to 50 kHz

(C) 10 kHz to 15 kHz

(D) 25 Hz to 50 Hz



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29. A servo motor is a typical example of -

(A) Electronics system

(B) Mechanical system

(C) Computer system

(D) Mechatronics system

30. Which type of position can be determined by a position sensor ?

(A) Mechanical position

(B) Lateral position

(C) Prove position

(D) Lithotomy position

31. What is the maximum shear force, when a cantilever beam is loaded with UdL throughout ?

(A) $w \times l$

(B) w

(C) w/l

(D) $w + l$

32. Which of these refrigerants is highly flammable and toxic ?

(A) R – 12

(B) Sulphur dioxide

(C) Carbon dioxide

(D) Ammonia


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33. The intake charge in a diesel engine consists of -

(A) Air alone

(B) Air+ lubricating oil

(C) Air +fuel

(D) Air + fuel + lubricating oil

34. Main advantage of a two-stroke engine over four-stroke engine is -

(A) More uniform torque

(B) More power output for cylinder of same dimensions

(C) Absence of values valves

(D) All of the above

35. Factory of safety is equal to _____.

(A) $\frac{\text{Allowable stress}}{\text{failure stress}}$

(B) $\frac{\text{Allowable load}}{\text{failure load}}$

(C) Allowable stress × failure stress

(D) $\frac{\text{failure stress}}{\text{Allowable stress}}$

36. The relation between modulus of elasticity (E), modulus of rigidity (G) and Poisson's ratio ($\mu$) is given by -

(A) $G = 2E\,(1 + \mu)$

(B) $G = 3E\,(1 - 2\mu)$

(C) $E = 2G\,(1 + \mu)$

(D) $E = 3G\,(1 - 2\mu)$



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37. The relation between tensile stress and tensile strain is termed as -

(A) Modulus of rigidity

(B) Modulus of elasticity

(C) Bulk Modulus

(D) Poisson's ratio

38. Poisson ratio is expressed as -

(A) -Lateral stress/ Lateral strain

(B) Longitudinal stress/ Longitudinal strain

(C) -Lateral strain / Longitudinal strain

(D) Lateral strain/ Longitudinal stress

39. A cantilever beam of length L is subjected to a uniformly distributed load w per unit length. The maximum bending moment will be equal to -

(A) $\frac{wL}{2}$

(B) $\frac{wL^2}{2}$

(C) $\frac{wL^2}{4}$

(D) $\frac{wL^2}{8}$

40. At the point of contra flexure -

(A) Bending moment changes sign

(B) Bending moment is maximum

(C) Shear force is maximum

(D) Shear force changes sign



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41. The bending moment diagram for a cantilever beam whose free end is subjected to a bending moment -

(A) Triangular

(B) Rectangular

(C) Parabola

(D) Cubic parabola

42. A continuous beam is one which is -

(A) Fixed at one end and free at the other end

(B) Fixed at one end hinged at other end

(C) Supported on more than two supports

(D) Extending beyond the supports

43. The value of the viscosity of an ideal fluid is -

(A) Zero

(B) Unity

(C) Infinity

(D) More than that of a real fluid

44. Hooke's law holds good up to -

(A) Elastic limit

(B) Limit of proportionality

(C) Yield point

(D) Breaking point



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45. Which of the relationship between bulk modulus (K), modulus of elasticity (E) and modulus of rigidity (G) is correct -

(A) $G = \frac{9KE}{K+3E}$

(B) $G = \frac{9KE}{E+3K}$

(C) $E = \frac{9KG}{3G+K}$

(D) $E = \frac{9KG}{3K+G}$

46. 1 tonne of refrigeration is equivalent to -

(A) 746 ks/min

(B) 210 ks/min J/min

(C) 267 ks/min

(D) 540 ks/min

47. _____ is the horizontal structural members subjected to transverse loads perpendicular to its axis -

(A) Strut

(B) Column

(C) Beam

(D) Truss

48. Of a refrigerator and a heat pump working on the reversed cornot cycle between the same temperature limit then -

(A) Cop of Heat pump = Cop of refrigerator

(B) Cop of Heat pump= Cop of refrigerator+1

(C) Cop of Refrigerator= Cop of heat pump+1

(D) Cop of Refrigerator=1/Cop of Heat pump



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49. The difference between wet bulb temperature and dry bulb temperature -

(A) Dew point temperature depression

(B) Wet bulb temperature depression

(C) Saturation temperature

(D) Adiabatic saturation temperature

50. The air temperature at which water vapour in the air starts condensing is known as -

(A) Dry bulb temperature

(B) Wet bulb temperature

(C) Saturation temperature

(D) Dew point temperature

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