

GU-RET 2016

GAUHATI UNIVERSITY RESEARCH ELIGIBILITY TEST

MECHANICAL ENGINEERING

Booklet Series :

A

Invigilator's Name and
Signature

BOOKLET NO.

OMR SHEET NO.

ROLL NO.

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TIME : 2 HOURS 20 MINUTES

TOTAL MARKS : 80

Number of Pages in this Booklet : 14

Instructions for Candidates

1. Write your Roll No. and OMR Sheet No. in the boxes provided above.
2. This paper consists of two sections : **Section B** with 50 (fifty) multiple choice questions (MCQ) and **Section C** with 8 (eight) descriptive questions. Each MCQ has 4 (four) answers, out of which **ONLY** one is correct. You have to darken the circle (on the OMR Sheet) for the correct answer corresponding to the question given in this booklet.

Example : (A) (B) (C) (D)

where (C) is the correct answer. No marks will be given for markings made in this booklet. The descriptive questions in **Section C**, **MUST** be answered in the space provided in this booklet. **No extra pages will be provided in any case.**

3. Use a BLACK ball point pen in your OMR Sheet.
4. Read the instructions given inside this booklet before attempting to answer any questions.
5. **DO NOT** write your name, roll no, phone no, or anything, or put any marks anywhere in this booklet, otherwise your candidature will be disqualified.
6. If you are found to resort to any kind of unfair means such as carrying extra material other than pen, pencil, watch, eraser, and scale, or copying from somebody or from external material, your candidature will be disqualified.
7. Use of mobile phones, programmable calculators, log tables or any other tables, wearable smart devices such as smart Android watches or objects of similar nature **CAN NOT** be used inside the examination hall. **Simple and scientific calculators can be used.**
8. At the end of the examination, you have to return this booklet and the OMR Sheet back to the invigilator.
9. There is no negative marks for incorrect answer.

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Section B (50 Marks)

1. Which of the following statements is correct?
 - (A) Compressibility factor is unity for ideal gases
 - (B) Compressibility factor is zero for ideal gases
 - (C) Compressibility factor is less than unity for ideal gases
 - (D) Compressibility factor is more than unity for ideal gases
2. The instrument preferred in the measurement of highly fluctuating velocities in air flows is
 - (A) Pitot-static tube
 - (B) Propeller type anemometer
 - (C) Three cup anemometer
 - (D) Hot wire anemometer
3. The time constant of thermocouple is
 - (A) the time taken to attain 100% of initial temperature difference
 - (B) the time taken to attain 63.2% of initial temperature difference
 - (C) the time taken to attain 50% of initial temperature difference
 - (D) the minimum time taken to record a temperature reading.
4. A metal plate has a surface area of 2 m^2 , thickness 10 mm and a thermal conductivity of 200 W/m-K . What is the thermal resistance of the plate?
 - (A) $4 \times 10^4 \text{ K/W}$
 - (B) $2.5 \times 10^{-3} \text{ K/W}$
 - (C) $1.5 \times 10^{-5} \text{ K/W}$
 - (D) $2.5 \times 10^{-5} \text{ K/W}$
5. For a Newtonian fluid
 - (A) Shear stress is proportional to shear strain
 - (B) Rate of shear stress is proportional to shear strain
 - (C) Shear stress is proportional to the rate of shear strain
 - (D) Rate of shear stress is proportional to rate of shear strain
6. If the upstream Mach number of a normal shock occurring in air ($k = 1.4$) is 1.68, the Mach number after shock is
 - (A) 0.84
 - (B) 0.646
 - (C) 0.336
 - (D) 0.564
7. Prandtl number of a flowing fluid greater than unity indicates that hydrodynamic boundary layer thickness is
 - (A) greater than thermal boundary layer thickness
 - (B) equal to thermal boundary layer thickness
 - (C) less than thermal boundary layer thickness
 - (D) independent of thermal boundary layer thickness
8. Which of the following elements/alloys exhibits season cracking?
 - (A) Iron
 - (B) brass
 - (C) Aluminium
 - (D) Steel
9. The mechanical efficiency of an internal combustion engine is expressed as the ratio of
 - (A) brake power to indicated power
 - (B) indicated power to brake power
 - (C) mechanical power to brake power
 - (D) brake power to frictional power
10. The angle obtained between the machined surface and underside of the tool is generally named as
 - (A) clearance angle
 - (B) relief angle
 - (C) edge angle
 - (D) nose angle

11. In case of SI engine, to have the best thermal efficiency, the fuel-air mixture ratio should be
- rich
 - lean
 - may be rich or lean
 - same
12. Fuel injector is used for
- SI engine
 - Gas engine
 - CI engine
 - Steam engine
13. The ratio of the lateral strain to the linear strain is called
- modulus of rigidity
 - Poisson's ratio
 - bulk modulus
 - modulus of elasticity
14. The tool used for rapid machining of hard metals is
- cemented carbide
 - high speed steel
 - stellites
 - None of these
15. The plastic deformation that takes place in a narrow zone in the vicinity of the cutting edge is called
- plastic zone
 - shining zone
 - shear zone
 - yield zone
16. Batch type production system is suitable under
- JIT
 - FMS
 - CIM
 - None of these
17. The relative velocity of B with respect to A in a rigid link AB is
- parallel to AB
 - perpendicular to AB
 - along AB
 - at 45° to AB
18. The C.O.P of a refrigerating machine, when lower temperature is fixed, can be improved by
- raising the higher temperature
 - lowering the higher temperature
 - keeping higher temperature constant
 - None of the above
19. Pelton turbine is a type of
- Reaction turbine
 - Impulse turbine
 - Radial flow turbine
 - Axial flow turbine
20. Which of the following casting processes is best suited for manufacturing of long sewage pipes
- Investment casting
 - Gravity die casting
 - Centrifugal casting
 - Pressure die casting
21. Working temperature in hot working of metal is
- Above recrystallisation temperature
 - Below recrystallisation temperature
 - At the recrystallisation temperature
 - Depend on physical condition
22. According to Lami's Theorem
- the three forces must be equal
 - the three forces must be at 120° to each other
 - the three forces must be in equilibrium
 - if the three forces acting at a point are in equilibrium, each force is proportional to the sine of the angle between the other two

23. The process of cutting a flat piece of desired shape from a sheet metal is called
- (A) Stamping
 - (B) Piercing
 - (C) Trimming
 - (D) Blanking
24. Collapsible tubes are manufactured by
- (A) Impact extrusion
 - (B) Forward extrusion
 - (C) Backward extrusion
 - (D) Hydrostatic extrusion
25. The vertical passage for filling molten metal into a mould cavity is called
- (A) Gate
 - (B) Sprue
 - (C) Runner
 - (D) Riser
26. In which of the following casting processes wax pattern is used?
- (A) Investment casting
 - (B) Die casting
 - (C) Centrifugal casting
 - (D) Continuous casting
27. The process used for mass production of gear
- (A) Casting
 - (B) Milling
 - (C) Powder metallurgy
 - (D) Hobbing
28. Seamless tube can be produced by
- (A) Forging
 - (B) Welding
 - (C) Roll piercing
 - (D) Peening
29. Charpy test is used to measure
- (A) Hardness
 - (B) Fatigue strength
 - (C) Tensile strength
 - (D) Impact strength
30. Brinell number of a material is a measure of its
- (A) Ductility
 - (B) Hardness
 - (C) Resilience
 - (D) Yield strength
31. Annealing heat treatment is carried out to
- (A) To soften the material
 - (B) To increase the hardness
 - (C) To increase the toughness
 - (D) To increase the strength
32. Hardening treatment of steel results in the formation of
- (A) Pearlite
 - (B) Austenite
 - (C) Ferrite
 - (D) Martensite
33. TTT diagram indicates the transformation of into other phases
- (A) Austenite
 - (B) Ferrite
 - (C) Pearlite
 - (D) Bainite
34. The property of material essential for spring material is
- (A) Stiffness
 - (B) Ductility
 - (C) Resilience
 - (D) Toughness
35. Coplanar concurrent forces are those forces which
- (A) meet at one point, but their lines of action do not lie on the same plane
 - (B) do not meet at one point and their line of action do not lie on the same plane
 - (C) meet at one point and their line of action also lie on the same plane
 - (D) do not meet at one point, but their lines of action lie on the same plane

36. If a number of forces are acting at a point, their resultant will be inclined at an angle θ with the horizontal, such that
- (A) $\tan \theta = \frac{\Sigma H}{\Sigma V}$
 (B) $\tan \theta = \frac{\Sigma V}{\Sigma H}$
 (C) $\tan \theta = \Sigma V \times \Sigma H$
 (D) $\tan \theta = \sqrt{\Sigma V + \Sigma H}$
37. Hook's Law holds good up to the
- (A) Yield Point
 (B) Elastic Limit
 (C) Plastic Limit
 (D) Breaking Point
38. The unit of modulus of elasticity is same as those of
- (A) stress, strain, and pressure
 (B) stress, force, and modulus of rigidity
 (C) strain, force, and pressure
 (D) stress, pressure, and modulus of rigidity
39. The law of thermodynamics that throws the light on the concept of increase in entropy
- (A) second law
 (B) third law
 (C) fourth law
 (D) Joule's law
40. Which one of the following components is not a boiler accessory?
- (A) injector
 (B) superheater
 (C) feed pump
 (D) safety valve
41. The compression ratio of Diesel engine may have the range of
- (A) 8 to 10
 (B) 10 to 15
 (C) 16 to 20
 (D) none of the above
42. For high head and low discharge, the hydraulic machinery selected is
- (A) Francis turbine
 (B) Kaplan turbine
 (C) Pelton turbine
 (D) None of these
43. If maximum velocity at the centre of pipe is greater than the average velocity by two times then the flow is
- (A) laminar flow
 (B) turbulent flow
 (C) transitional flow
 (D) None of these
44. Both the resultant force and couple must be zero in order to have complete balance of the several revolving masses in
- (A) different planes
 (B) same plane
 (C) horizontal plane
 (D) vertical plane
45. The tool life under oblique cutting in comparison to that of orthogonal cutting is
- (A) same
 (B) less
 (C) more
 (D) None of these
46. If the number of instantaneous centres obtained in a mechanism is ten, the mechanism is
- (A) five bar mechanism
 (B) four bar mechanism
 (C) three bar mechanism
 (D) six bar mechanism
47. Which one of the following is the micro factor which affects material requirement planning?
- (A) inventory level
 (B) price trend
 (C) business cycle
 (D) profit level

48. The material handling cost under heavy manufacturing system depends on

- (A) move
- (B) material
- (C) method
- (D) All of the above

49. A streamline and an equipotential line in a flow field

- (A) are parallel to each other
- (B) are perpendicular to each other
- (C) intersects at an acute angle
- (D) are identical

50. The major loss in CI engine is

- (A) Pumping loss
- (B) Rubbing friction loss
- (C) Direct heat loss
- (D) Loss due to incomplete combustion

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Section C (30 Marks)

Answer any 5 (five) from the following

1. Differentiate between static equilibrium and dynamic equilibrium of rigid bodies under the action of coplanar non concurrent forces. (Marks : 6)
2. What do you mean by tolerance, limits and fits? Explain. (Marks : 6)
3. What is kinematic pair? Write the classification of kinematic pair according to the nature of relative motion between the elements with suitable sketch and example. (Marks : 6)
4. Deduce the expression of Bernoulli's equation from Euler's equation of fluid motion. (Marks : 6)
5. What are the causes of formation of CO in IC engines? How does CO affect human health? Explain the term COHb in this context. (Marks : 6)
6. Calculate the decrease in available energy when 25 kg of water at 95° is mixed with 35 kg of water at 35°C , the pressure being taken as constant and the temperature of the surrounding being 15°C (c_p of water = 4.2 kJ/kgK). (Marks : 6)
7. What do you mean by cubic crystals? Draw suitable sketches of different types of cubic crystals. (Marks : 6)
8. Write the differences between PERT and CPM of network analysis used in project management. (Marks : 6)

Space for Answers (Section C) : for Questions 1 to 8 (6 pages)

GU-RRET 2018

Space for Answers (Section C) : for Questions 1 to 8 (6 pages)

GU-RFET 2019

Space for Answers (Section C) : for Questions 1 to 8 (6 pages)

GU-RREF 2019

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