ARKAJAIN University
Jharkhand

5th Semester Examination –2021-22

Subject : Internal Combustion Engine & Gas Turbine **Roll No: .....**
Course : B.Tech (ME)
Full Marks : 70 **Time: 3 Hours.**

Instructions to the Candidates:

- **Read the question paper very carefully.**
- **Candidates are required to give their answers in their own words as far as practicable.**
- **Question Paper is divided into Three Parts –A, B & C.**
- **Part-A is containing 12 multiple choice questions.**
- **Part- B containing SIX questions out of which FOUR questions are to be answered.**
- **Part C containing FOUR questions out of which TWO questions are to be answered.**
- **Do not write anything except your Roll No. on the question paper.**
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PART A

MULTIPLE CHOICE QUESTIONS **(12x1=12)**

1. What is compression ratio in IC engine
   a. Ratio of maximum cylinder volume to the clearance volume
   b. Ratio of clearance volume to the maximum volume
   c. Ratio of swept volume to the maximum volume
   d. None of these

2. Use of oil ring in the piston is
   a. To protect crank chamber from burnt gas
   b. Wipe of the excess oil from the cylinder wall
   c. To take out engine oil to combustion chambe
   d. None of these

3. Otto cycle have
   a. Two isentropic and two constant volume process
   b. Two constant pressure and two constant volume process
   c. Two constant pressure and two entropy constant process
   d. Two isothermal and two isobaric process

4. The ratio of indicated thermal efficiency to the corresponding air standard cycle efficiency is called
   a. Net efficiency b. Efficiency ratio c. Relative efficiency d. Overall efficiency

5. If the compression ratio of an engine working on Otto cycle is increased from 5 to 7, the % age increase in efficiency will be
   a. 2% b. 4% c. 8% d. 14%

6. Which part is not available in petrol engine
   a. Fuel injector nozzle b. Spark plug c. Exhaust valve d. Carburetor

7. Clearance volume in IC engine is general termed as
   a. Remaining volume of the cylinder when piston is at BDC

b. Remaining volume of the cylinder when piston is at TDC
c. The ratio of TDC and BDC
d. None of these

8. In a typical medium speed 4-stroke cycle diesel engine
   a. Compression starts at 35° after bottom dead center and ends at top dead center
   b. Compression starts at bottom dead center and ends at top dead center
   c. Compression starts at 10° before bottom dead center and, ends just before top dead center
   d. May start and end anywhere

9. Which statement is correct of dual cycle
   a, Cycle have two isochoric process
   b. Cycle have one constant pressure and constant volume process
   c. Cycle have two constant pressure and two isentropic process
   d. None of these

10. Fuel injector of the engine is used to
    a. Spray fuel on spark plug
    b. Spray coolant on engine chamber
    c. Spray fuel in Compression Ignition engine
    d. None of these

11. Carburetor is used for
    a. Filtering the air
    b. Separate fuel and air to supply engine
    c. To supply rich fuel to the engine
    d. To supply air and fuel mixture to the engine

12. Fuel is injected into the cylinder at the end of _____ stroke.
    a. Suction b. Compression c. Expansion d. Exhaust

PART B

ANSWER ANY FOUR OUT OF SIX **(4x7=28)**

1. Write a short note on fuels used for I.C. Engine.
2. Define Rocket propulsion? What are the Requirements of an ideal rocket propellant?
3. Name the main steps involve in 4-stroke IC engine?
4. What are the measures of IC engine performance?
5. Draw a typical constant pressure combustion turbine plant? Also explain the different process in g turbine power plant.
6. What is valve timing diagram? Draw the valve timing diagram for 4-stroke SI engine. Explain it.

PART C

ANSWER ANY TWO OUT OF FOUR **(2 x15=30)**

1. Explain with neat sketch the working of Carburetor. Also derive an expression for flow through carburetor.
2. Derive an expression for thermal efficiency of dual cycle.
3. A six-cylinder, gasoline engine operates on the four-stroke cycle. The bore of each cylinder is 80 m and the stroke is 100 mm. The clearance volume per cylinder is 70 cc. At the speed of 4100 rpm, fuel consumption is 5.5 gm/sec (or 19.8 kg/hr.) and the torque developed is 160 Nm. Calculate: Brake power, (ii) The brake mean effective pressure, (iii) Brake thermal efficiency if the calor value of the fuel is 44000 kJ/kg and (iv) The relative efficiency on a brake power basis assuming engine works on the constant volume cycle $\Upsilon = 1.4$ for air.
4. A spark-ignition engine working on ideal Otto cycle has the compression ratio 6. The initial press and temperature of air are 1 bar and 37°C. The maximum pressure in the cycle is 30 bar. For unit m flow, calculate (i) p, V, and T at various salient points of the cycle and (ii) the ratio of heat supp to the heat rejected. Assume γ=1.4 and R=8.314kJ/kmol K.

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Jharkhand

5th Semester Examination –2021-22

Subject	: Organizational Behavior	Roll No: .....
Course	: B.Tech ME	
Full Marks	: 70	Time: 3 Hours.

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PART A

MULTIPLE CHOICE QUESTIONS (12x1=12)

1. **At the norming stage, the team is involved in defining _____**
   a. Goals b. Roles c. Relations d. None of the above

2. **The model(s) of Organizational Behavior is (are):**
   a. Autocratic b. Custodial c. Supportive d. All of the above

3. **"Leadership motivates the people to work and not the power of money", this concept is related to**
   a. Autocratic model b. Custodial model c. Supportive Model d. Collegial Model

4. **According to Herzberg, which of the following is a maintenance factor?**
   a. Salary b. Work itself c. Responsibility d. Recognition

5. **_____ advocated that humans are essentially motivated by levels of needs.**
   a. Maslow b .Follet c. Elton mayo d. Ivon Pavlov

6. **In order from lowest to highest, what are Maslow's five classes of needs?**

   a. .Social-esteem-physiological-safety-self-actualization
   b. Physiological-safety-social-self-actualization-esteem
   c. Physiological-safety-social-esteem-self-actualization
   d. .Self-actualization-esteem-safety-social-physiological

7. **Which among the following is the lowest level need under Need Hierarchy Theory of Motivation?**
   a. Physiological Needs
   b. c. social Needs
   c. Safety and Security Needs
   d. Self-esteem Needs

8. **According to Frederick Herzberg, _____ are elements associated with conditions surrounding the job.**
   a. Hygiene factors
   b. Economic factors
   c.. Motivating factor
   d. Environmental factors

9. **Which of the following is NOT an internal motivational force?**
   a. Goals b. Needs c. Attitudes d. Feedback

10. **An employer gives her employees individual bonuses for their work performance. This is an example of a(n):**
   a. Drive b. Need c. Extrinsic incentive d. Intrinsic incentive

11. **Melissa is a good role model for her team mates. She wants to make sure her team does well and wins the conference championship. Her desire to attain this goal is described as:**
   a. Intrinsic motivation b. extrinsic motivation c. A drive d. A need

12. **Scope of OB does not include**
   a. Leadership b. Perception c. Job Satisfaction d. Technology

PART B

ANSWER ANY FOUR OUT OF SIX **(4x7=28)**

1. "Beauty lies in the beholder". Explain the statement along with the perception process.
2. What is Locus of Control? Explain with help of an Example.
3. Elaborate on the SOBC model of O.B. Give Examples.
4. What is the meaning of the term personality? How can personality be developed?
5. Explain Johari Window.
6. What do you mean by Group Dynamics? Also explain how it affects the productivity of an organization.

PART C

ANSWER ANY TWO OUT OF FOUR **(2x15=30)**

1. Define leadership & state its importance along with different leadership styles.
2. Distinguish clearly between intrapersonal and interpersonal group. Quote an example. How does it deteriorate teamwork in the organization?
3. What are five categories of motivational needs described by Maslow?
4. Explain Herzberg's two factor Theory?

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5th Semester Examination –2021-22

Subject	**: Heat & Mass Transfer**	**Roll No**	**: .....**
Course	**: B.Tech Mechanical**		
Full Marks	**: 70**	**Time**	**: 3 Hours.**

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PART A

MULTIPLE CHOICE QUESTIONS **(12x1=12)**

1. For an absolutely white or specular body
   a. $\alpha = 1, \rho = 0 \& \tau = 0$
   b. $\alpha = 0, \rho = 0 \& \tau = 1$
   c. $\alpha = 0, \rho = 1 \& \tau = 0$
   d. $\alpha + \tau = 1 \& \rho = 0$

2. Provision of fins on a given heat transfer surface will be more effective if there are _____ number o _____ fins.
   a. Fewer, thick b. Large, thick c. Large, thin d. Fewer, thin

3. The critical thickness of insulation in case of a cable of dia d, ho = 12.5W/m 2 K and k = 0.15W/m K is
   a. 12m b. 24m c.24 mm d. 12mm

4. The quantity 1/ hA is called _____ to heat flow
   a. Convective resistance
   b. Conductive resistance
   c. Radiative resistance
   d. No such term exists

5. What happens when the thickness of insulation on a pipe exceeds the critical value?
   a. There is decrease in the heat flow rate.
   b. There is increase in the heat flow rate.
   c. The heat flow rate remains constant.
   d. The temp rises at the junction bet pipe & insulation.

6. The temp distribution during transient heat conduction does not depend upon
   a. Location of point within the solid
   b. Biot no
   c. Prandtl number
   c. Fourier Number

7. The thermal resistance for heat conduction through a hollow sphere of inner radius r_1 and outer radius r_2 is

a. $(r_2 - r_1)/ 4\pi k\, r_1\, r_2$
b. $(r_2 - r_1)\, r_1\, r_2/ 4\pi k$
b. $4\pi k\, (r_2 - r_1) / r_1\, r_2$
d. $k\, (r_2 - r_1)/ 4\pi\, r_1\, r_2$

8. Thermal boundary layer is a region where
   a. Heat dissipation is negligible
   b. Inertia and convection terms are of the same order of magnitude
   c. Convection and dissipation terms are of the same order of magnitude
   d. Convection and conduction terms are of same order of magnitude.

9. Forced convection in a liquid bath is caused by
   a. Density difference brought about by temp gradient
   b. Molecular energy interaction
   c. Flow of electrons in a random fashion
   d. Intense stirring by an external agency

10. Which of the following situation is free or natural convection?
   a. Cooling of internal combustion engine
   b. Flow of water inside the condenser tube
   c. Cooling of billets in atmosphere
   d. Air conditioning installations and nuclear reactors

11. Consider a fully developed laminar flow and heat transfer in a uniformly heated long circular tube. If the flow velocity is doubled and the tube dia is halved the heat transfer coefficient will become / remain _____ the original value.

a. Four times b. Double c. Half d. Same

12. Transient conduction means
   a. Very little heat transfer
   b. Heat transfer for a short time
   c. Heat transfer with a very small temp difference
   d. Conduction when the temp at a point varies with time

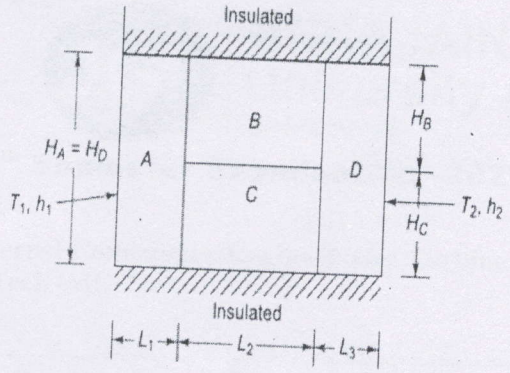
PART B

ANSWER ANY FOUR OUT OF SIX **(4x7=28)**

1. Explain thermal resistance and electric analogy for thermal resistance.

2. Briefly explain the significance of following dimensionless numbers. Reynolds number, Graph of number and Prandtl number. A cross flow type air heater has an area of 80 cm 2. The overall transfer coefficient is 200 W/m 2 K and heat capacity of both hot and cold stream is 2000 W/K. the value of NTU is.

3. Given: The composite wall having unit length normal to the plane of paper and the equivalent circuit are shown in Fig. below HA = H□ = 3 m, H□ = Hc = 1.5 m L□ = L□ = 0.05 m, L□ = 0.1 m KA = KD = 50 W/mK, kg = 10W/mK, kc = I W/mK T□ = 200°C, h□ = 50 W/m² K. T□ = 25°C, h□ = 10W/m²K. To find: The rate of heat transfer through the wall.



4. What is meant by free or natural convection & forced convection? What is meant by laminar flow and turbulent flow?

5. Explain Kirchhoff's law. Two radiating surfaces A1 = 3 meter square and A2 = 2 m 2 have shape factor F1-2 = 0.1. Then the shape factor F2-1 will be.

6. Explain the stages of boiling.

PART C

ANSWER ANY TWO OUT OF FOUR

(15x2=30)

1. Define Fin effectiveness & Fin efficiency .Which of the following arrangement of pin fins will give higher heat transfer rate from a hot surface?

a. 6 Fins of 10 cm length
b. 12 Fins of 5 cm length

The base temperature of the fin is maintained at 200°C and the fin is exposed to a convection environment at 15°C with convection coefficient 25 W/m^2-deg. Each fin has cross-sectional area 2.5 cm^2, perimeter 5 cm and is made of a material having thermal conductivity 250 W/m-deg. neglect the heat loss from the tip of fin.

2. Derive one dimensional general differential heat conduction equation in Cartesian co-ordinate

3. A furnace wall comprises three layers: 13.5 cm thick inside layer of fire brick, 7.5 cm thick middle layer of insulating brick and 11.5 cm thick outside layer of red brick. The furnace operates at 870°C and it is anticipated that the outside of this composite wall can be maintained at 40°C by the circulation of air. Assume close bonding of layers at their interfaces. The wall measures *5 m x 2 m* and the data on thermal conductivities is:

a. Fire brick k1= 1.2 w/m deg
b. Insulating brick K2= 0.14 w/m deg
c. Red brick k3= 0.85 w/m deg
d. Determine
e. The rate of heat loss from the furnace
f. The wall interface temperature.

4. What is critical thickness of insulation? A rod of 10mm square section and 160mm length with thermal conductivity of 50 W/m-deg protrudes from a furnace wall at 200°C, and is exposed to air at 30°C with convection coefficient comment on the result. Adopt a long fin model for the arrangement.