BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: B.TECH **SEMESTER : V**
BRANCH: MECHANICAL **SESSION : MO/2022**

SUBJECT: ME301 IC ENGINE AND GAS TURBINE

TIME: 3:00 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a)	Discuss the assumptions made in the analysis of fuel air cycle.	CO-1, PO-1, BT-L	[2]
Q.1(b)	Distinguish between four-stroke CI engine and SI engine.	CO-1, PO-1, BT-M	[3]
Q.1(c)	An air-standard Diesel cycle operates with a compression ratio of 16.7 and a cut off ratio of 2. At the beginning of compression, the air temperature and pressure are 37 °C and 0.10 MPa, respectively. Evaluate (a) maximum temperature in the cycle and (b) pressure after isentropic expansion.	CO-1, PO-3, BT-H	[5]
Q.2(a)	Explain the phenomena of knock in SI engines.	CO-2, PO-1, BT-L	[2]
Q.2(b)	Bring out clearly the process of combustion in CI engines and explain the various stages of combustion.	CO-2, PO-1, BT-M	[3]
Q.2(c)	Discuss the effect of following engine variables on flame propagation in SI engine: Fuel Air Ratio (ii) Compression Ratio (iii) Engine load	CO-2, PO-1, BT-L	[5]
Q.3(a)	Explain how additives help to achieve the desired properties of lubricant.	CO-3, PO-1, BT-L	[2]
Q.3(b)	Explain the working principle of port injection and throttle body injection system.	CO-3, PO-1, BT-L	[3]
Q.3(c)	Derive an expression for air-fuel ratio of a simple carburetor.	CO-3, PO-1, BT-L	[5]
Q.4(a)	Discuss the importance of specific fuel consumption.	CO-4, PO-1, BT-L	[2]
Q.4(b)	Point out the emissions that come out of CI engine exhaust.	CO-4, PO-1, BT-M	[3]
Q.4(c)	During trial of a single cylinder, 4 stroke oil engine the following results were obtained: Cylinder bore = 200mm, Stroke = 300mm, mep = 5 bar, Torque = 407Nm, speed = 400 RPM, Oil consumption = 5kg/hr, CV of fuel = 44MJ/kg, Cooling water rate = 4.5kg/min, Air used per kg of fuel = 30kg, Rise in cooling water temp=40°C, Temp of Exhaust gases=420°C, Room temp=30°C, mean sp. heat of exhaust gases = 1kJ/kgK, Sp. heat of water = 4.18kJ/kgK, Barometric pressure = 1.01325 bar. Evaluate IP, BP and draw up heat balance sheet in kJ/hr.	CO-4, PO-3, BT-H	[5]
Q.5(a)	List out the merits of a gas turbine over IC engine.	CO-5, PO-1, BT-L	[2]
Q.5(b)	Describe the working principle of Turbo-prop jet engine with a suitable diagram.	CO-5, PO-1, BT-L	[3]
Q.5(c)	Consider an ideal air-standard Brayton cycle in which the air into the compressor is at 100 kPa, 25°C, and the pressure ratio across the compressor is 14:1. The maximum temperature in the cycle is 1200°C, and the air flow rate is 10 kg/s. Assuming constant specific heat for the air, Calculate the compressor work, the turbine work, and the thermal efficiency of the cycle.	CO-1, PO-3, BT-M	[5]

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